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14. ABSTRACT 1801 individuals attended the 2010 International Meeting on Simulation in Healthcare and had access to Preconference courses, Expert panels, keynote Plenary Sessions, roundtables, and workshop sessions to further their knowledge of use of simulation in healthcare to improve patient safety and manage resources. 45 workshops provided both hands-on and interactive learning in the areas of conducting research, outcomes based assessment, case development, disaster training, needs assessment and competency based training. Panels and keynotes addressed education, research, simulations operations, interactive environments, credentialing & assessment, clinical areas, economics of simulation and standardized patients. 170 peer reviewed research abstracts were presented and selections will be published in the Society's Journal, Simulation in Healthcare. Additionally, 166 non-peer reviewed works in progress abstracts were presented and published in the course program.					
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Introduction

The International Meeting on Simulation in Healthcare (IMSH) is the official meeting of the Society for Simulation in Healthcare (SSH).

The SSH mission is to bring together investigators, educators, and health care practitioners from a broad range of medical and paramedical specialties that are interested in health care simulation in all of its forms.

IMSH featured keynote speakers, workshops, panels, research and “work in progress” poster and presentation sessions covering topics such as: surgical training devices, patient safety, curriculum development, simulation center operations, performance evaluation, developing metrics, debriefing simulation experiences, and training applications (crisis management, credentialing and assessment, faculty development, trauma, clinical emergencies, teamwork skills, etc.) This year’s conference also added in immersive simulation sessions in Obstetric and Emergency Scenarios for small groups of 20. Additionally, a team competition was added, called “SimWars” in which teams were given Scenarios and graded by the audience and appointed judges. Final teams were given awards at the final plenary session.

This contract provided funding support for the conference faculty and publication of the research abstracts in the syllabus and the Society’s peer-reviewed journal.

Body

Over 1800 individuals involved in simulation in healthcare attended the 2010 conference and participated in panels, workshops, peer-reviewed research and non-peer-reviewed “work in progress” abstract presentations. The TATRC contract provided funds for the publication of the peer-reviewed research abstracts and support for the faculty of general session panels and workshops. The schedule below of the general sessions and workshops identifies the content areas covered by the conference and identifies the faculty experts participating. The appendix includes a pdf of the section of the syllabus for the peer-reviewed abstracts which is being published in the Society’s Journal, Simulation in Healthcare, now accepted for indexing in Medline® and a document showing the workshops (with named faculty) conducted at the conference.

The growth in attendance, which more than doubled since 2006, clearly indicates the growing interest and need for continued education in the area of simulation in healthcare at quality CME/CE activities such as IMSH. The research abstract authors benefited from individualized attention at the “Professor Rounds” whereby conference faculty interacted directly with the authors. Interaction and networking between attendees and faculty at the conference will likely result in additional research by individuals and new multi-center research opportunities.

Published research abstracts will be available on-line through the publisher and on the Society’s website. Additionally, selected sessions were video taped and will be made available to the membership on-line on the Society’s website (www.ssih.org). Selected faculty presentations are available on-line for conference attendees.

Below is the conference schedule at a glance that gives an overview of the meeting breakdown.

IMSH 2010 – 10th Anniversary Conference Program

Legend:

EP – Expert Panel
IM – Immersive Course
PC – Pre-Conference Workshop
PS – Plenary Session
RT – Roundtable
SW – SimWars
WS – Workshop
VS – Video Session

Saturday, January 23, 2010

Pre Conference Sessions Saturday, 1:00 pm – 5:00 pm

PC1.A	Evidence-Based Scenario Development: A Model Using End-of-Life Care
PC1.B	Research: Where Do I Start?
PC1.C	Advanced Scenario Design: Context, Realism, and Unrealism in Simulation
PC1.D	Assessing and Improving Debriefing: Training Raters to Use the Debriefing Assessment for Simulation in Healthcare (DASH)
PC1.E	Moulage & More: Outrageous Tricks and Amazing Tools to Create Simulation Reality
PC1.F	Instructor Training 2 – Technical Debriefing
PC1.G	Developing a Simulation Program

Sunday, January 24, 2010

Pre Conference Sessions Sunday, 8:00am – 12:00 pm

PC2.H	Essentials of Simulation-Based Education: A Primer for Instructors
PC2.I	Instructor Training 2 – Difficult Debriefing
PC2.J	Simulation Based Research: Tips, Tricks & Tools of the Trade
PC2.K	Multidiscipline CRM Training via Medical Simulation
PC2.L	Leadership Skills for Simulation Centers
PC2.M	Simulation Enhanced Curriculum Design - A Systematic Approach Based on Educational Principle
PC2.N	Developing Simulation Stations for use in Objective Simulated Clinical Examinations (OSCE's)

Regular Program Schedule:

12:15 PM - 12:45 PM	New Member/New Attendee Orientation
3:00 PM - 6:00 PM	Grand Opening of Exhibit Hall
3:00pm	Ribbon Cutting Ceremony - Hall Entrance
4:30pm – 6:00pm	Welcome Reception in Hall

Monday, January 25, 2010

7:00 AM 4:00 PM	Research Abstract Posters
7:00 AM 4:00 PM	Works-in-Progress Abstract Posters

8:00 AM 10:15 AM PS3.01 301BCD

Opening Plenary Session

Best Overall Trainee Research
Abstract Oral Presentation

Keynote Address: ***Helping Babies Breathe, Susan Niermeyer, M.D.***

10:30 AM 5:30 PM EXHB PCC – Hall 1 Exhibit Hall Open

10:30 AM 12:00 PM EP3.01	Curriculum Development in Pediatric Simulation
10:30 AM 12:00 PM EP3.02	Standardized Patient-Based Debriefing: Methods & Outcomes
10:30 AM 12:00 PM EP3.03	RESEARCH ABSTRACT AWARD PRESENTATION - Education, Competency & Assessment
10:30 AM 12:00 PM RT3.01	Using Simulation to Improve Patient Safety
10:30 AM 12:00 PM VS3	Simulation Center Videos
10:30 AM 12:00 PM WS3.01	Improving Debriefing Skills: Ways to Debrief and Coach the Debriefers <i>Identical Workshop offered Wednesday at 8:00 AM</i>
10:30 AM 12:00 PM WS3.02	Examining Contemporary Theory, Environment, and Resources for Virtual Reality and Game-based Learning
10:30 AM 12:00 PM WS3.03	Incorporation of Family Members into Training of Multidisciplinary Healthcare Teams During Pediatric Simulations
10:30 AM 12:00 PM WS3.04	Blowing Up the Barriers to Simulation Training: A Demonstration of Distributed Simulation
10:30 AM 12:00 PM WS3.05	Task Trainers, Patient Simulators, & EHRs: Oh My!
10:30 AM 12:00 PM WS3.06	Assessment in High Fidelity Patient Simulation
10:30 AM 12:00 PM WS3.07	Effective <i>Train the Raters</i> Workshops – A Crucial Component of Simulation-Based Testing and Evaluation
10:30 AM 12:00 PM IP3.01	SSH Accreditation: What it Can Mean for Your Program
11:30 AM 1:00 PM	Luncheon in Exhibit Hall
12:30 PM 2:30 PM IM3.01	Experience Simulation: A Rough Delivery. Multidisciplinary Learning Experience for the Simulation Novice
12:30 PM 2:30 PM IM3.02	Experience Simulation: Drama in the ER. Multidisciplinary Learning Experience for the Simulation Novice
1:00 PM 2:30 PM EP3.04	Integrating Simulation into a Multidisciplinary Curricula
1:00 PM 2:30 PM EP3.05	Use of Simulation to Enhance Procedural Skills
1:00 PM 2:30 PM EP3.06	RESEARCH ABSTRACT AWARD PRESENTATION - Impact of Simulation: Context & Physical Setting
1:00 PM 2:30 PM IP3.02	How to Use the New SSIH Website
1:00 PM 2:30 PM RT3.02	Changing Hospital Culture: Incorporating Simulation Technology to Create a Highly Reliable Team- Based Healthcare Practice
1:00 PM 2:30 PM RT3.03	Resident Orientation: Assessment with Simulation and Standardized Patients
1:00 PM 2:30 PM	Simulation Center Videos

1:00 PM 2:30 PM WS3.08	Games-Based Learning: Preparing Your Students for Human Factors Simulation
1:00 PM 2:30 PM WS3.09	Heath Care Team Debriefing: An In Situ Simulation Exercise
1:00 PM 2:30 PM WS3.10	How to Partner Lean Thinking with High-Fidelity Simulation
1:00 PM 2:30 PM WS3.11	Assessment of Non-Technical Skills of Surgical Teams in Simulation
1:00 PM 2:30 PM WS3.12	Creating Adjuncts To Physician And Nursing Simulation Education
1:00 PM 2:30 PM WS3.13	Debriefing Undergraduate Healthcare Learners: A Practical and Evidence-Based Approach
1:00 PM 2:30 PM WS3.14	You Can Fix It and We Can Help
3:30 PM 5:00 PM EP3.07	Staying Cool: Using Simulation to Take the Stress out of Handling Critical Events
3:30 PM 5:00 PM EP3.08	The Simulation Triangle: Merging Physical, Virtual and Human Simulations
3:30 PM 5:00 PM RT3.04	Is the Outcome Worth the Effort? Possibilities with Modern Tools for Data Analysis & Visualization of Complex Medical Training
3:30 PM 5:00 PM RT3.05	Open Source, Open Architecture Physiologic Models
3:30 PM 5:00 PM RT3.06	Mannequin Simulation for High Stakes Summative Assessment: Developing a National Testing Strategy
3:30 PM 5:00 PM SW3.01	Simwars
3:30 PM 5:00 PM VS3.03	Simulation Center Videos
3:30 PM 5:00 PM WS3.15	Integration of a Clinical Decision Support System to Teach and Assess Diagnostic Reasoning During Simulated Training Scenarios.
3:30 PM 5:00 PM WS3.16	Makeup Special Effects and Medicine
3:30 PM 5:00 PM WS3.17	Transforming Patient Safety Outcomes by Implementing Standardized, Simulation-Based Programs for Practicing Clinicians
3:30 PM 5:00 PM WS3.18	Simulation Confederate Boot Camp- Creating Realistic Role Plays to Enhance Interdisciplinary Simulation Fidelity and Learner Engagement
3:30 PM 5:00 PM WS3.19	Simulation on a Shoestring Budget: Just Do It
3:30 PM 5:00 PM WS3.20	Oscar the Grouch: Using Popular Media to Engage Difficult Personalities
3:30 PM 5:00 PM WS3.21	Behind the Sim Curtain: Tips & Tricks
5:00 PM 5:30 PM	Society for Simulation in Healthcare (SHH) Annual Business Meeting and Awards Presentation

Tuesday, January 26, 2010

7:00 AM 4:00 PM PST	Research Abstract Posters
7:00 AM 4:00 PM PST	Works-in-Progress Abstract Posters
7:30 AM 10:15 AM PS4.01	Plenary Session Best Overall Research Abstract Oral Presentation Keynote Address: 10th Anniversary IMSH Lecture: At the Threshold of a New Frontier "Quality, Safety & Reform: An AMA Perspective" James Rohack, M.D., AMA President Research Keynote: "Why Hospitals Don't Learn from Failures: Organizational and Psychological Dynamics That Inhibit System Change", Amy Edmonson, PhD.
9:30 AM 10:30 AM PST	PROFESSOR ROUNDS - Education, Competency & Assessment Category
10:00 AM 2:00 PM	Exhibit Hall Open – Hall Closes at 2:00pm and teardown begins
10:30 AM 12:00 PM EP4.01	Hot Topics in Pediatric Research
10:30 AM 12:00 PM EP4.02	ISBMS: International Symposium on Biomedical Simulation
10:30 AM 12:00 PM EP4.03	RESEARCH ABSTRACT AWARD PRESENTATION - Patient Related Outcomes, Research in Simulation, Including Patient Safety
10:30 AM 12:00 PM EP4.04	Operations Track: I Am in the Process of Building or Expanding a Simulation Center
10:30 AM 12:00 PM RT4.01	Houston, We Have a Mission: Building & Sustaining a Multidisciplinary Hospital-Based Simulation Center
10:30 AM 12:00 PM RT4.02	Development of Special Interest Networks in Simulation
10:30 AM 12:00 PM VS4.01	Simulation Center Videos
10:30 AM 12:00 PM WS4.01	Teaching Family-Centered Care within High Stakes Clinical Environments via Simulation: Demonstration of Three Approaches

	Incorporating Whole-body Mannequin Simulation and Relational (Actor)-based Methodologies
10:30 AM 12:00 PM WS4.02	It's a Validity Thing: Producing Measures That Count
10:30 AM 12:00 PM WS4.03	From Movies to the Clinical Skills Centre: Enhancing the Realism of Hybrid Simulation
10:30 AM 12:00 PM WS4.04	Optimizing the Educational Value of Standardized Patients' Feedback to Medical-Simulation Trainees Through Structured Training - The MSR Model
10:30 AM 12:00 PM WS4.05	Teaching and Assessing Competency in Difficult Communication Skills
10:30 AM 12:00 PM WS4.06	Make The Most Out Of The ACS/ APDS Skills Curriculum: A Guide To Its Effective And Efficient Implementation
10:30 AM 12:00 PM WS4.07	Incorporating Team STEPPS Within Simulation Events for CRM and Patient Safety
10:30 AM 12:00 PM WS4.08	Evaluation Methods in Simulation Training for Invasive Procedures
11:30 AM 1:00 PM	Luncheon in Exhibit Hall
12:00 PM 1:00 PM PSTR	PROFESSOR ROUNDS – Impact of Simulation: Context & Physical Setting Category and Patient Related Outcomes, Research in Simulation, Including Patient Safety Category
12:30 PM 2:30 PM IM4.01	Experience Simulation: A Rough Delivery. Multidisciplinary Learning Experience for the Simulation Novice
12:30 PM 2:30 PM IM4.02	Experience Simulation: Drama in the ER. Multidisciplinary Learning Experience for the Simulation Novice
1:00 PM 2:30 PM EP4.05	Developing Tools for Simulation Evaluation: Advice From the Trenches
1:00 PM 2:30 PM EP4.06	Innovative Applications of Pediatric Simulation
1:00 PM 2:30 PM EP4.07	RESEARCH ABSTRACT AWARD PRESENTATION - Human Factors Oriented, Simulation Based Research
1:00 PM 2:30 PM EP4.08	Operations Track: We've Just Built a Simulation Center – Now What?
1:00 PM 2:30 PM IP4.01	SSH Certification – What it Can Mean for Your Career
1:00 PM 2:30 PM RT4.03	The Specifics of a Pre-Hospital Simulation, Not so Special After All
1:00 PM 2:30 PM VS4.02	Simulation Center Videos
1:00 PM 2:30 PM WS4.09	Train the Trainer - the MSR Model of Instructor Training
1:00 PM 2:30 PM WS4.10	Debriefing in The Real World: Practical Debriefing Techniques
1:00 PM 2:30 PM WS4.11	Propelling Scholarship: From Inception of a Simulation Curriculum To Publication through MedEdPORTAL
1:00 PM 2:30 PM WS4.12	Large Scale Medical Simulation as a SimCity Challenge - Development, Planning, Operation and Debriefing with Comprehensive Software Support - The MSR Model
1:00 PM 2:30 PM WS4.13	Creating Educational Videos Using Simulation
1:00 PM 2:30 PM WS4.14	The Business of Simulation. Is There A Return on Investment (ROI)?
2:30 PM 3:30 PM PSTR	PROFESSOR ROUNDS – Human Factors Oriented, Simulation Based Research Category and Emerging & Innovative Methods & Technology Education Category
3:30 PM 5:00 PM EP4.09	Addressing Clinical Placement Shortages: Pediatrics as a Case in Point
3:30 PM 5:00 PM EP4.10	Using Behavioral Marker Systems (ANTS & SPLINTS) To Rate Performance of Personnel
3:30 PM 5:00 PM EP4.11	Skills for Trainees and Academic Researchers in Simulation (STARS): Defining the Needs, Challenges and Resources Available for Inexperienced Researchers
3:30 PM 5:00 PM EP4.12	Operations Track: Our Center Has Been Set Up for Awhile. What are Others Doing?
3:30 PM 5:00 PM IP4.02	How to Use the New SSIH Website
3:30 PM 5:00 PM RT4.04	Conversations on Inter-professional Education Simulation Experiences
3:30 PM 5:00 PM RT4.05	Building Adaptive Infrastructure for Successful & Sustainable Simulation Programs
3:30 PM 5:00 PM SW4.01	Simwars
3:30 PM 5:00 PM VS4.03	Simulation Center Videos

3:30 PM 5:00 PM WS4.15	Making it Real on a Shoestring: Practical, Budget-Friendly Ways to Enhance Realism in Ob-Gyn Simulation
3:30 PM 5:00 PM WS4.16	Designing Scenarios and Measurement Tools for Teamwork Skills Training
3:30 PM 5:00 PM WS4.17	Simulation in Healthcare Workshop for Reviewers (and Authors)
3:30 PM 5:00 PM WS4.18	How to Use the BAT: Assessment of CRM-based Behavioral Skills in Simulation Using a Validated, Reliable Tool
7:00 PM 10:00 PM	IMSH 10th Anniversary Celebration!!

Wednesday, January 27, 2010

8:00 AM 9:30 AM EP5.01	Medico-Legal Implications of Video Storage of Health Provider Performance
8:00 AM 9:30 AM EP5.02	Winning Over the Education Commissioners
8:00 AM 9:30 AM EP5.03	RESEARCH ABSTRACT AWARD PRESENTATION - Emerging and Innovative Methods and Technology Education
8:00 AM 9:30 AM EP5.04	Collaboration in Simulation – Can You Afford NOT to be Part of One?
8:00 AM 9:30 AM IP5.01	How to Use the New SSIH Website
8:00 AM 9:30 AM RT5.01	Is High Tech Simulation High Fidelity Simulation?
8:00 AM 9:30 AM SW5.01	Simwars - Finals
8:00 AM 9:30 AM WS5.01	Bringing Crisis Resource Management (CRM) to Life: CRM Scenario Making in Movie Director Mode
8:00 AM 9:30 AM VS5.01	Simulation Center Videos
8:00 AM 9:30 AM WS5.02	Creating and Using Branching Virtual Patients with Open Labyrinth
8:00 AM 9:30 AM WS5.03	Improving Debriefing Skills: Ways to Debrief and Coach the Debriefers - <i>Identical session offered on Monday at 10:30 AM</i>
8:00 AM 9:30 AM WS5.04	The Trade Game: The Use of Games to Develop Non-Technical Skills.
8:00 AM 9:30 AM WS5.05	Demystifying Debriefing (or “Debriefing for the Common Man”)
8:00 AM 9:30 AM WS5.06	TEST PILOT: Advanced Medical Simulation as a Tool to Assess New Clinical Settings and Systems
10:00 AM 12:00 PM PS5.01	Plenary Session Keynote Address: <i>The Australian Frontier – The Evolving Story of a National Simulation Plan Downunder.</i> Brendan Flanagan, M.D.
12:00 PM	IMSH 2010 Adjourns

Key Research Accomplishments

None

Reportable Outcomes

- 171 Peer-reviewed abstracts presented at the 2007 IMSH conference and subsequently published in the Journal
- 45 Peer-reviewed workshop presentations in interactive format
- 4 keynote presentations
- Keynotes and selected panel presentations will be made available to members on the Society's website www.ssih.org

Conclusions

As a result of this project, the current research being conducted by those in the simulation in healthcare field was disseminated to over 1800 individuals and further distribution of this information will be available in the public domain through the Society's journal publisher and the Society's website.

References

None

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Appendix 1 – Saturday Programming

Saturday, January 23, 2010

PC1.A: Evidence-Based Scenario Development: A Model Using End-of-Life Care

Faculty: Scott Compton, Rosemarie Fernandez, M.D., Steve W. J. Kozlowski, Richard Redman

This interactive session will promote evidence-based scenario design and assessment methodology in the development of blended HPS/SP modules to facilitate high quality end-of-life care education for nursing and physician providers.

PC1.B: Research: Where Do I Start?

Faculty: William C. McGaghie, Ph.D., Jeffrey Groom, Ph.D., C.R.N.A.

This course will outline the process for designing a research project, optimizing both the quality of the science and the efficacy of the process.

PC1.C: Advanced Scenario Design: Context, Realism, and Unrealism in Simulation

Faculty: Ian Curran, M.D., Peter Dieckmann, Ph.D., Steven K. Howard, M.D., Keiichi Ikegami, M.D., Mark W. Scerbo, Ph.D.

Context is important for human action, during clinical treatment and simulation-based learning. This course focuses on context from two different but related angles. First, an improved understanding of context factors that lead to action errors and the factors that facilitate of hinder error detection will be examined. Then, attendees will work toward an improved understanding of simulation-based contexts that facilitate of hinder to learn more from errors.

PC1.D: Assessing and Improving Debriefing: Training Raters to Use the Debriefing Assessment for Simulation in Healthcare (DASH)

Faculty: Marisa B. Brett-Fleegler, M.D., Walter Eppich, M.D., M.Ed., Jenny Rudolph, Ph.D., Robert Simon, Ed.D.

Assessing and improving the debriefing process is a vital, ongoing component of effective simulation education. This course will introduce the use of DASH - the Debriefing Assessment for Simulation in Healthcare. The development and philosophy underlying the DASH assessment tool and its implications for use in simulation debriefing procedures will be the focus.

PC1.E: Moulage & More: Outrageous Tricks and Amazing Tools to Create Simulation Reality

Faculty: Becky Damazo, R.N., P.N.P., M.S.N., David Damazo, M.D., Betsy Voelker, A.A.

In this session, faculty will demonstrate how it is possible to make convincingly accurate representations of wounds, burns, and injury. Participants will create reusable moulage items using realistic gel effects materials—designed to work seamlessly with human patient simulators.. Time will be allowed for participants to develop specialty items for obstetrics, trauma and burns. Participants will learn basic principles used to incorporate moulage into case scenarios.

PC1.F: Technical Debriefing

Faculty: Liat Pessach, Orit Shalomson, Amitai Ziv., M.D., M.H.A.

This course will highlight the different methods of debriefing that can be used to accomplish simulation education objectives.

PC1.G: Developing a Simulation Program

Faculty: Bonnie Driggers, M.S., M.P.A., R.N., Michael Seropian, M.D.

This 4.0 hour intensive course will focus on the core concepts necessary to develop a simulation program and facility. Participants will be expected to function in groups to develop and present their collective work in creating a simulation center. Faculty will supplement the work of the participants with their experience and understanding of best practice.

Appendix 2: Sunday Programming

Sunday, January 24, 2010

PC2.H: Essentials of Simulation-Based Education: A Primer for Instructors

Faculty: Walter Eppich, M.D., M.Ed., Ralf Krage, M.D.

Simulation educators agree that competent instructors are the key to successful learning experiences by students at all levels of training ("the key is the programme, not the hardware"). This course is designed for those who want to learn more about instructor training and individuals with some simulation experience. Participants will improve their approach to debriefing and better incorporate principles of crisis resource management. During debriefing exercises, participants will identify their strengths and weakness as instructors and develop personal strategies for future improvement. The course also introduces important topics typically included in more comprehensive instructor courses. The course directors and faculty have extensive experience both debriefing simulations as well as training simulation instructors. The syllabus and course materials will contain tips and tricks to improve your skill as a simulation instructor.

PC2.I: Difficult Debriefing

Faculty: Mary Patterson, M.D., M.Ed., Dan Raemer, Ph.D.

This course will engage attendees in exercises in facing difficult debriefings. The instructors will model setting a framework for a safe environment. There will be interactive exercises demonstrating difficult participant situations and issues. Problems may include the resistant or defensive participant, loquacious or quiet students, summative assessment considerations, upset, angry or tearful participants, extreme reactions, etc. Various skills for dealing with difficult debriefings will be discussed including: advocacy/inquiry, normalizing, time-out, violent agreement, redirecting, validating, and retargeting attention.

PC2.J: Simulation-Based Research: Tips, Tricks & Tools of the Trade

Faculty: JoDee Anderson, M.D., M.Ed., Adam Cheng, M.D., FRCPC, FAAP, Aaron Donoghue, M.D., M.S.C.E., Elizabeth Hunt, M.D., M.P.H., Ph.D., Judy LeFlore, Ph.D., R.N., Vinay Nadkanri, M.D., M.S., Akira Nishisaki, M.D., Jenny Rudolph, Ph.D., Robert Simon, Ed.D.

A hands-on workshop that includes a brief, interactive overview of fundamental steps for conducting multi-center simulation research and focuses on training participants on the use of practical, easy to use assessment tools and resources utilized in simulation-based research protocols.

PC2.K: Multidiscipline CRM Training via Medical Simulation

Faculty: Linda L. Brown, M.D., M.S.C.E., John L. Foggie, M.D., M.B.A., David G. Lindquist, M.D., FACEP, Frank L. Overly, M.D., FAAP, Lynn A. Sweeney, M.D.

This course will examine strategies by which simulation can be used to engage a team of multidisciplinary healthcare professionals in CRM training.

PC2.L: Leadership Skills for Simulation Centers

Faculty: Ben Berg, M.D., Brian C. Brose, M.D., William Dunn, M.D., Valerie M. Howard, Ed.D., R.N., Paul Phrampus, M.D.

This course will focus on essential leadership skills necessary for an effective and successful simulation program. Topics will include getting buy-in from administrators and other key leaders, developing a mission statement, and mentoring leadership within the simulation center.

PC2.M: Simulation Enhanced Curriculum Design - A Systematic Approach Based on Educational Principle

Faculty: Peter Dieckmann, Ph.D., Yue Ming Huang, Ed.D., M.H.S., Suzan E. Kardong-Edgren, Ph.D., Viva Jo Siddall, M.S., R.R.T., R.C.P., C.C.M.E.-P.

Accrediting bodies are mandating residency programs, medical, nursing and allied health schools to develop simulation training for their learners. Simulation-enhanced curriculum has also attracted attention from Maintenance Of Licensure and Maintenance Of Certification accrediting bodies as a viable addition to continuing medical education offerings. Designing scenarios take time, but developing an integrated simulation curriculum or complete learning module is even more challenging. Drawing from instructional design experts, educational psychologists and clinical educators from the SSH Education Committee, this course will provide a foundation and structure to developing a curriculum with multiple simulation modalities and action learning strategies. Participants will leave with curricular design strategies that they can apply at their own institution

PC2.N: Developing Simulation Stations for use in Objective Structured Clinical Examinations (OSCE's).

Faculty: Barry Issenberg, M.D., Geoff Miller, Ross Scalese

This session will explore the use of Objective Structured Clinic Examinations (OSCE's) in simulation education. All aspects of the development and implementation of this important simulation resource will be covered.

Appendix 3: Monday Programming with Descriptions

PS3.01: Opening Plenary Session and Keynote

Welcome and Opening Remarks:

Walter Eppich, M.D., M. Ed. and Katie Walker, RN, RM
IMSH 2010 Co-Chairs

Presidential Address

Mary Patterson, M.D., M.Ed., 2010 SSH President

Oral Presentation - Research Abstract Winner, Trainee. Central Venous Catheter Dress Rehearsal: Every Line Counts

Authors: Amy Scholtz, MSN, RN, WHNP-BC, Evi Lengetti, M.S.N., R.N., Anne Marie Monachino, M.S.N., R.N., C.P.N., Vinay Nadkarni, M.D., M.S., Dana Niles, M.S., CCRC, Akira Nishisaki, M.D.

Central line-associated blood stream infections (CLABSI) are a key patient safety issue. Observations and focus groups at the authors' children's hospital suggest inconsistency in knowledge and implementation of central venous catheter (CVC) dressing change policy. A novel CVC Dress Rehearsal program was developed using simulation allowing nurses to practice CVC dressing changes prior to providing direct care for patients with a CVC. The purpose of this study was to determine if "just in time" and "just in place" simulation based training will improve staff nurses' confidence and competence in knowledge and psychomotor skills during CVC dressing change practice.

Michael S. Gordon Center for Research in Medical Education Lecture Introduction of Keynote:

Walter Eppich, M.D., M. Ed., IMSH 2010 Co-Chair

Helping Babies Breathe - Susan Niermeyer, M.D.

This presentation will focus on Dr. Niermeyer's inspiring work with neonatal resuscitation in the global context. Although simulation-based educators often focus on technology, this year's keynote address will highlight the potential for simulation training in low tech /resource limited environments that lead to meaningful patient outcomes. Dr. Niermeyer has been working to assess the impact of a global curriculum in neonatal resuscitation not only with learning outcomes (knowledge, skills, and attitudes) but also with neonatal outcomes.

EP3.01: Curriculum Development in Pediatric Simulation Expert Panel

Faculty: Peter Weinstock, Ph.D.

EP3.02: Standardized Patient-Based Debriefing: Methods & Outcomes Expert Panel

Faculty: Karen L. Reynolds, RN, MS, Mindi Anderson, Ph.D., R.N., CPNP-PC, ANEF, Tony Errichetti, Ph.D., Rachel Yudkowsky, M.D., MHPE

Standardized patients (SPs) afford learners the unique opportunity to obtain feedback from the patient's perspective. SPs can provide feedback in a variety of formats including written comments, group debriefing, and individual coaching. Debriefing conversations with SPs may facilitate integration of information and allow learners to experiment with new and more effective behaviors. This panel discussion will provide examples of how standardized patients are utilized to provide learner-centered feedback at three different institutions. The panel will also present challenges faced in the delivery of SP feedback and discuss the efficacy of debriefing methods and outcomes.

EP3.03: Oral Presentation: Award Winning Research Abstract Submission in Education, Competency & Assessment. Simulation-Based Training Improves Applied Clinical Placement of PICC Lines for Junior Radiology Residents Expert Panel

Moderator: Kianoush B. Kashani, M.D. Authors: Pamela B. Andreatta, M.D., Yifang Chen, M.D., Kyung Cho, P.A., Michael Marsh, M.H.A.

Skilled placement of peripheral intravenous central catheters (PICC) has a profound impact on patient wellbeing and costs of care. There is some evidence that simulation-based training may support the acquisition of cannulation skills, and more concrete evidence that it increases learner self-efficacy in performing central venous catheterization. This study applied simulation to train residents in the practice of ultrasound-guided peripheral intravenous cannulation and found evidence that simulation acquired PICC skills transfers to applied clinical practice, and that transfer appears to be more robust than that achieved through conventional rotation based residency training. The use of simulation to support the acquisition of vascular access devices is merited for the benefits to patient wellbeing, clinician performance and costs-of-care design of an acute care room for a PED. While there is theoretical overlap between the domains of Lean and SIM, little formal work has been done to unite the respective areas. The design and renovation of a new pediatric emergency department (PED) offered an opportunity to apply both techniques. We successfully combined SIM with Lean methodology, allowing staff and leadership to determine whether room elements/design added value to patient care prior to actual construction of the PED. Lean also offered an innovative way to analyze and debrief simulation in-situ by focusing on non-medical aspects of the scenario.

**EP3.06 Oral Presentation - Runner-Up Research
Abstract Submission in Impact of Simulation Context &
Physical Setting. Identification of Medical Simulation
Center Operational Characteristics at Children's
Hospitals
Expert Panel**

Authors: David A. Young, M.D., S. Barry Issenberg, M.D.

This is the first known study to identify and compare the operational characteristics of medical simulation centers for freestanding and children's specialty hospitals located in the United States. Approximately 25% of freestanding and children's hospitals were identified to have a pediatric medical simulation center. Most of the identified simulation centers were operational less than five years. This implies a rapid growth of medical simulation centers among children's hospitals. In contrast, we did not identify any pediatric medical simulation center that has closed. While most of the centers have a formal process for their organizational and operations processes, a large number do not have a formal mechanism for instruction development, evaluation and feedback. Future research should focus on following changes in the requirements for simulation center accreditation.

**EP3.06 Oral Presentation - Honorable Mention
Research Abstract Submission in Impact of Simulation
Context & Physical Setting. Complete Integration of a
Simulation Center into Active Intensive Care Workspace:
A Feasibility Study
Expert Panel**

Authors: Aaron W. Calhoun, Kimberly Boland, M.D., Megan Boone, R.N., M.S.N., Vicki L. Montgomery, M.D.

Simulation is an effective means to teach the principles of crisis resource management (CRM) to pediatric providers. On-site simulation offers many advantages over the more traditional off-site approach, but many centers do not have the space to dedicate to such a program. The development of portable high-fidelity simulators has now opened the possibility of true insitu simulation delivered at the point of care. The objective of this study was to report on the development, implementation, cost, and results of an in-situ simulation-based pediatric CRM program. The authors hypothesized that implementation of the program would increase the time spent by resident and nurse clinicians in simulation-based educational activities and that the program would result in increased participant knowledge regarding the management of pediatric crises.

IM 3.01 -Experience Simulation: A Rough Delivery.
Multidisciplinary Learning Experience for the Simulation
Novice
Immersive Course

Faculty: Christine Keenan, MSN, RN, CCRN, Jill Sanko, MSN, ARNP, Alexis Battista, MBA, NREMT-P, Carol Durham, EdD, RN, ANEF, Jenifer O. Fahey, CNM, MSN, MPH, Roxane Gardner, MD, MPH, Stefan Gisin, MD, Jean-Marie Guise, MD, MPH, Danyel Helgeson, MS, RN, Connie M. Lopez, MSN, RN, CNS, RNC, Jose Pliego, MD, Christopher Strother, MD

This innovative workshop led by multidisciplinary teams from the SSIH Special Interest Groups (SIGs) will provide an experiential learning experience where participants will be taught about simulation from the perspective of the learner, for future application in their simulation endeavors. Scenario immersion, followed by small group discussions where core simulation concepts and debriefing skills will be introduced, close the loop for this unique concept in teaching the fundamentals of simulation as a teaching tool.

IM3.02 -Experience Simulation: Drama in the ER. A
Multidisciplinary Learning Experience for the Simulation
Novice
Immersive Course

Faculty: Christine Keenan, MSN, RN, CCRN, Jill Sanko, MSN, ARNP, Alexis Battista, MBA, NREMT-P, Carol Durham, EdD, RN, ANEF, Jenifer O. Fahey, CNM, MSN, MPH, Roxane Gardner, MD, MPH, Stefan Gisin, MD, Jean-Marie Guise, MD, MPH, Danyel Helgeson, MS, RN, Connie M. Lopez, MSN, RN, CNS, RNC, Jose Pliego, MD, Christopher Strother, MD

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IP3.02 -How to Use the New SSH Website
Informational Panel (no credit offered)

RT3.02 Changing Hospital Culture: Incorporating Simulation Technology to Create a Highly Reliable Team-Based Healthcare Practice

Round Table Discussion

Faculty: Lou Halamek M.D., Julie Arafeh, R.N., M.S.N., Cassie Bergero, R.N., M.S.N., Sarah Ferrari, R.N., M.S.N., Linda Hargreaves, R.N., M.S.N., Julie Kennedy, R.N., Amy Nichols, Ed.D., M.S.N., R.N., Stephanie Winch, R.N.

In this round table forum we would like to discuss the approach our hospital took to break down barriers found in most organizations that impede implementation of change. This process of changing the hospital's culture launched an on-going system wide change to simulation-based training that encompasses maintaining competencies, improving communication practices, detection of near-miss occurrences and emphasizing interdepartmental team training.

RT3.03 Resident Orientation: Assessment with Simulation and Standardized Patients

Round Table Discussion

Faculty: Amy B. Smith, Ph.D., Deborah Arnold, R.N., CMSRN, William Bond, M.D., M.S., Gordon J. Green, M.D., FRCP[C], FAAP, J. P. Orlando, Ed.D., Melissa Walsh, B.S.,

Participants at this roundtable session will discuss baseline assessment with simulation and standardized patients during new resident orientation.

SW3.01-Simwars

Immersive Course

Faculty: Steven A. Godwin, MD, Haru Okuda, MD

Simwars is an interactive simulation competition that allows teams of clinical providers to compete against each other on simulated patient encounters in front of a large audience. An expert panel will judge each teams performance in areas such as teamwork, communication, and leadership as well as in the medical management of the "patient". The audience will vote on the winner of each case using the audience response system based on their direct observation and the panels' input. Each encounter will be recorded by an advanced AV system that can capture multiple views of the simulation and merge with the physiological input. Ultimately there can be only one 2010 IMSH Simwars Champion.

WS3.08 Games-Based Learning: Preparing your Students for Human Factors Simulation

Workshop

Faculty: Eric B. Bauman, Ph.D., Louise Hull, M.D.

This is a new, hands-on, how-to workshop for participants interested in introducing games into their simulation programming. This workshop draws from years of experience related to adult and clinical education, and will offer an interactive approach to the implementation of this exciting and effective educational component.

WS3.09 Health Care Team Debriefing: An In Situ Simulation Exercise Workshop

Faculty: Laura L. Hall, PhD, Beth Beaudin-Seiler, MPA, William Hamman, MD, PhD

This workshop will provide simulation educators an opportunity to enhance their debriefing skills. In situ simulation offers a potent approach to teambased learning in the hospital setting, with interdepartmental and institutional multidisciplinary health care providers performing a simulated care scenario while being videotaped. Guided review of the videotape is the most critical educational component of the simulation experience, typically reflecting the first time health care providers view their own work performance along with their colleagues in video format, making, as noted by Robert Wood Johnson Foundation senior program officer and noted health policy author Rosemary Gibson, the “the invisible visible.” Researchers and health educators involved in in situ simulation must be able to promptly recognize key components of teamwork, communication, and system barriers and effectively guide health care providers in the review of their performance in a way that is both nonthreatening and conducive to identifying and implementing improved team performance.

WS3.10 How to Partner Lean Thinking with High-Fidelity Simulation Workshop

Faculty: Lennox Huang, MD, Dianne Norman, RN, BScN, Jennifer Reid, MD

This workshop will focus on Lean principles and how they can be incorporated into healthcare. Lean principles originate from Japanese manufacturing, particularly the Toyota production system. “Lean thinking”, essentially means using less to do more. The focus is on the elimination of waste - of time, energy, supplies, movement and money. By eliminating waste, the goal is to assure that every step in a process adds value. Lean principles are being incorporated into healthcare around the world. In the 2005 Institute for Healthcare Improvement publication “Going Lean in Health Care”, Lean principles are shown to improve quality and efficiency in health care, while reducing costs. A key concept of Lean thinking is “value stream mapping”. This involves mapping out every step of a current process, followed by envisioning, and mapping, a “perfected” version of the process. Lean principles recognize that implementing and sustaining change require changes to be implemented quickly, analyzed openly, and adjusted continuously. Simulation is a tool that allows healthcare providers to recreate a clinical process. When Lean principles are integrated with simulation, they can be used together to map elements of a process, implement change, analyze interventions, and evaluate sustainability.

WS3.11 Assessment of Non-Technical Skills of Surgical Teams in Simulation Workshop

Faculty: Nick Sevdalis, PhD, Louise Hull, MSc

Simulation has been the mainstream training route for non-technical skills in OR personnel. Reduced training time and increased shift-working are key factors that necessitate training within a safe, learning-friendly environment. Simulation offers effective learning environments, welcomed by trainees and trainers. However, simulation-based training can only be effective if tools exist to robustly assess non-technical and technical performance. Historically, skills assessment in surgical, anaesthetic and nursing specialities has been unstructured and non-systematic. This has led to feedback that is often unreliable, unfocused, and thus not useful as a guide for learning. This is particularly the case for non-technical skills. This workshop will focus on the following two observational assessment tools for assessment of nontechnical skills in OR teams in simulation-based training. 1. Observational teamwork assessment for surgery (OATS) and 2. Non-technical skills (NOTECHS).

WS3.12 Creating Adjuncts To Physician And Nursing Simulation Education

Faculty: Ernest Wang, M.D., Pamela Aitchison, R.N., Richard Aronwald, M.D., Andy Arrequinm B.A., N.R.E.M.T.-B., Morris Kharasch, M.D., Christopher Pettineo, B.A.

Simulation center management involves developing multiple skill sets necessary for effective promoting a center's activities. The current economic climate renders many centers fiscally limited. Many institutions that are just starting up or deciding to expand have real budgetary constraints that can in developing websites, equipment and courses can be tremendous financial outlays if outsourced to other vendors. Alternative methods using available equipment and technologies allow viable and more reasonable financial outlays with minimal equipment and personnel are demonstrated in this curriculum.

WS3.13 Debriefing Undergraduate Healthcare Learners: A Practical and Evidence-Based Approach Workshop

Faculty: Moira Davenport, MD, Ander Douglas, MD, Rosemarie Fernandez, MD, Sharon Griswold-Theodorson, MD, Bethany Robertson, DNP, CNM

Content of this workshop will describe the evidence behind event-based scenario design and specifically outline how this approach can be used effectively for undergraduate students. Examples from nursing, physician, and allied health professions will be utilized with input from attendees. A high fidelity simulation (HPS)-based module will be used to target learning objectives. Participants will discuss which competencies their simulation targets and will identify triggers for particular behaviors.

WS3.14 You Can Fix It and We Can Help Workshop

Faculty: Robert Kerner, JD, RN, CEN, EMT-P, Margaret Delaney, RN, MSN, CEN, Ronald Ulrich, BA

The purpose of this workshop is to identify software and mechanical malfunctions common to human patient simulators and empower participants through active participation to troubleshoot these malfunctions. The presenters will also discuss and demonstrate several inexpensive and nondestructive modifications that improve the functionality of human patient simulators.

EP3.07: Staying Cool: Using Simulation to Take the Stress Out of Handling Critical Events Expert Panel

Faculty: Rhea Seddon, Lee Ayers, Steve Montague

After a brief overview of how life and death events provoke emotional and disruptive behavior, each speaker will describe, from his or her own professional training, how simulation can foster a calmer and more controlled handling of critical situations. Very different environments are described and job-specific competencies are discussed.

EP3.08: The Simulation Triangle: Merging Physical, Virtual and Human Simulations Expert Panel

Faculty: Sem Lampotang

Simulation labs employ a number of different tools and platforms. However, so far there has been little practical integration between simulation tools and devices, which in turn means simulation sessions are typically based around discrete episodes or activities, each of which is limited in scope by the affordances of the one device. Clearly this limits the utility of such simulators. Faculty for this panel are all members of the CANARIE-funded Health Services Virtual Organization (HSVO) that is bringing together experts from Canada and the US to create user controlled and interconnected remote platforms and devices as services. This affords interaction and data sharing between narrative, physiologic and mannequin based simulations, allowing them to be used in recombinant scenarios and settings. The panel will discuss the HSVO model for creating integrated simulation environments and some illustrative use cases. From a practical perspective the HSVO plan is to improve the education and training of health practitioners in distributed and remote settings by enabling rich multimodal simulation environments that can be connected to other devices, services and participants and configured to reflect shared data methods for all of the devices and services concerned, thereby breaking down the intrinsic silos around simulation devices and modalities. Once this fluid and open model is established it is likely that simulation practice will be able to move into new and uncharted territories.

RT3.04: Is the Outcome Worth the Effort? Possibilities with Modern Tools for Data Analysis & Visualization of Complex Medical Training

Round Table Discussion

Faculty: Mirko Thorstensson, M.Sc., Magnus Hultin, M.D., Ph.D., Johan Jenvall, Ph.D., J. Peter Kincaid, Ph.D., Penelope Sanderson, Ph.D.

The goal of the session is to increase participant awareness of possibilities with modern data analysis to improve outcome of medical training sessions. In complex distributed events with multiple parallel activities it can be difficult to create an integrated overview of cause-effect relationships, resources utilization and adherence to protocol, which can lead to lack of situational awareness for commanders and staff as well as degrading organizational performance. This is not only a problem in live operations, but most certainly also in analyzing simulation based training sessions for both training purposes and research on capability development. One way to enhance abilities to cope with data from multiple sources, geographically distributed and with different modalities and temporal extension, is to apply reconstruction and exploration (R&E).

RT3.05: Open Source, Open Architecture Physiologic Models

Round Table Discussion

Faculty: Hans van Oostrom, Ph.D. , Hugo Azevedo, M.D., Robert Hester, Ph.D., Peter Hunter, Ph.D.

The foundation of simulation in health care is a model of human physiology. However, today this foundation is weak, as there is no standard or open dialogue about most of the models in use today. Model architectures range from the low level open models, open model, closed calculation engine, to the proprietary models we find in commercial human simulation products. The goal of this workshop will be to bring together key experts in these various corners of simulation and work with the workshop participants to establish a direction of an open model architecture that can be used to define, create, and use better models of physiology.

RT3.06 -Mannequin Simulation for High Stakes Summative Assessment: Developing a National Testing Strategy

Roundtable Discussion

Faculty: Adam Cheng, MD, FRCPC, FAAP, Susan Brief, MD, FRCPC, Viren N. Naik, MD, M.Ed, FRCPC

This roundtable session will explore the potential benefits and pitfalls of using simulation as an assessment tool for residency training programs. In particular, simulation experts who have successfully integrated simulationbased assessment into their residency training programs will share with us their experience, and discuss the process that led to their success. Much of this session will be spent on discussing the steps required to help integrate simulation as an assessment tool into national specialty certifying exams. What will be required to achieve this lofty goal? What barriers will certifying

bodies face when attempting to integrate simulation into their exams? What is the ideal strategy to help facilitate this change? This session will engage participants in small group discussion and debate, and by the end, provide the framework necessary to help national certifying organizations move forward with using simulation as an assessment tool.

SW3.01: Simwars Immersive Course

Faculty: Steven A. Godwin, M.D., Haru Okuda, M.D.

Simwars is an interactive simulation competition that allows teams of clinical providers to compete against each other on simulated patient encounters in front of a large audience. An expert panel will judge each team's performance in areas such as teamwork, communication, and leadership as well as in the medical management of the "patient". The audience will vote on the winner of each case using the audience response system based on their direct observation and the panels' input. Each encounter will be recorded by an advanced AV system that can capture multiple views of the simulation and merge with the physiological input. Ultimately there can be only one 2010 IMSH Simwars Champion.

WS3.15 Integration of a Clinical Decision Support System to Teach and Assess Diagnostic Reasoning During Simulated Training Scenarios. Workshop

Faculty: James Carlson, II, MS, PA-C, John Tomkowiak, MD, MOL

This workshop will provide participants with the opportunity to use a clinical decision support system (CDSS) in conjunction with a virtual case training platform. Participants will examine how a CDSS might be used to improve and assess diagnostic reasoning during simulated training vignettes.

WS3.16 Makeup Special Effects and Medicine Workshop

Faculty: Jacqueline Jeffrey

Makeup special effects is the topic of this innovative workshop. Faculty will combine the art of makeup special effects with medicine to help participants create more effective simulation scenarios.

WS3.17 Transforming Patient Safety Outcomes by Implementing Standardized, Simulation-Based Programs for Practicing Clinicians Workshop

Faculty: Connie M. Lopez, MSN, RN, CNS, RNC, Jeff Convissar, MD, Mark Meyer, MD, Paul Preston, MD

To date, the focus of medical simulation has been on educating EMS, nursing students, medical students, and residents in academic settings, often through the use of costly simulation labs. However, simulation can have a broader

impact on patient safety and quality of care if it can be used as a tool to develop new skills and maintain existing clinical skills for the large group of practicing clinicians who are not exposed to simulation in an academic setting. For those institutions who cannot build a dedicated simulation lab, in-situ simulation is an excellent alternative that can be applied in the community setting. In addition to the use of simulation for education, these programs offer the potential for high stakes evaluation. Kaiser Permanente, a large, not-for-profit organization has successfully implemented a national patient safety program that includes standardized, in-situ, skill and team based simulation for practicing clinicians. This workshop will highlight how simulation can be integrated into all training programs to improve learning and decrease errors. Currently, new facilities and services are being tested using simulation, metrics are being identified and incorporated into simulation programs, and a national on-line system is being developed to track simulation training and data.

WS3.18 Simulation Confederate Boot Camp- Creating Realistic Role Plays to Enhance Interdisciplinary Simulation Fidelity and Learner Engagement Workshop

Faculty: Nicole Shilkofski, MD, M.Ed., Elizabeth Hunt, MD, MPH, PhD, Julianne Perretta, MEd, RRT-NPS,

Learners who are placed into high-complexity simulation scenarios, particularly advanced learners, often have a high threshold to suspend disbelief during their interpretation of a scenario's realism and therefore necessitate greater attention to fidelity issues by simulation educators. This perception of realism by learner participants is a key attitude target in the scripting and creation of simulation scenarios that lead to effective internalization of curricular goals and true transformational learning. During this workshop, we hope to demonstrate and discuss key ways in which confederate role plays can be optimally utilized in the modeling paradigm to effect attitude change in learners and enhance psychological fidelity of simulations and learner engagement as a result. Confederates can provide a means of assessing communication and non-technical skills of learners and can enhance fidelity by supplementing physical exam findings or bridging gaps in mannequin capabilities during scenarios. They can be utilized to provide first-hand feedback during debriefing which can be particularly efficacious during interdisciplinary simulations. This workshop will begin with division of the participants into small groups. Each small group will rotate through three different activities. In the first activity, DVD examples of brief simulations utilizing confederates will be used as triggers to promote small group discussions about optimal confederate techniques to address scenario challenges and mannequin limitations and thereby optimize psychological fidelity for learners. The second activity will use an audience response system to promote discussion of several learning theories that support the use of confederates to enhance psychological and environmental fidelity, including attitude change theory, message learning theory and modeling as a means of engaging learners. The third activity will require the participants to function as a team to create/script a cross- disciplinary role play within a simulation scenario as a means of promoting a shared understanding of other disciplines as a result of role play. The group will be required to work together to script a confederate's role within a scenario that is designed to meet specific learning objectives involving cross-disciplinary

communication.

WS3.19 Simulation on a Shoestring Budget: Just Do It Workshop

Faculty: Nancy Tofil, MD, M.Ed., Christopher A. Fore, MD, FACEP, Kathy McCleod, RN, Colleen Rutherford, RN, Marjorie Lee White, MD, MPPM, M.Ed., Lynn Zinkan, RN, MPH

This session will be geared for smaller hospitals with limited budgets or hospitals just beginning on their simulation journey. The content will be directed towards simulation centers in their early development giving new centers direction and concrete ideas on how to “just do it” and get started running a successful cost effective simulation program. The session will focus on active learner participation with many small group activities. We will start with moderators sharing lessons learned in the process of establishing active hospital based simulation centers. Practical tips will be provided on course development, fundraising, development of learning objectives, and practical programming tips for Laerdal, METI and Gaumard simulators. We will break up into groups and model through demonstration some inexpensive or free games which exemplify aspects of crisis resource management. While within small groups facilitators will help identify common real or perceived obstacles to starting simulation and offer practical real life examples of how to overcome these problems. Finally, the small groups will reconvene and the moderators will reveal some cost saving ideas for improvements in the fidelity of the simulation without adding substantial costs. In addition, Laerdal and METI scenarios will be available to participants to electronically transfer to hopefully jump start their home simulation programs. Finally we will create a list of inexpensive games allowing participants to take home concrete tools for use in their own centers.

WS3.20 Oscar the Grouch: Using Popular Media to Engage Difficult Personalities Workshop

Faculty: Mike Moyer, MS, Brian Pio, BA, Tom LeMaster, MSN, Med, RN, REMT-P, Jennifer Manos, RN, BSN, Tiffany Pendergass, RN, BSN

This workshop will focus on the non-engaging or difficult learner, the impact of disengaged team members on the entire learning team and the importance of learning to deal with this type of learner effectively.

WS3.21 Behind the Sim Curtain: Tips & Tricks for Operations Workshop

Faculty: Kam McCowan, BSE, WEMT-P, Jordan Halasz

Appendix 4: Tuesday Programming With Descriptions

Tuesday, January 26, 2010

PS4.01: Research Plenary Session and Keynotes

**Oral Presentation - Research Abstract Overall Winner.
Use of In Situ Simulations to Identify Barriers to Patient
Care for Ad Hoc Multicultural and Multidisciplinary
Teams in Resource-Constrained Settings
7:30 AM - 8:00 AM**

Faculty: Nicole Shilkofski, M.D., M.Ed., Elizabeth Hunt, M.D.,
M.P.H., Ph.D.

Key principles in crew resource management (CRM) include knowing the environment, effective communication and exercising leadership. Cultural differences and language barriers create obstacles to teamwork that can prevent effective CRM practice. This is particularly salient in ad hoc multicultural and multidisciplinary teams tasked to function in unfamiliar and resource-constrained settings in the developing world. It can be informative to study teams in situated context to identify remediable barriers to patient care and promote shared cognition amongst team members with different cultural norms and differing approaches to authority gradients and team leadership. The aims of our study were: 1) To use simulation to identify from an emic perspective team and environmental factors posing barriers to patient care within unfamiliar settings by ad hoc teams with members from different countries, practice settings and cultural backgrounds 2) To understand how in situ simulations in resource-constrained settings may impact team awareness and communication in order to improve patient care.

PS4.01: Keynote Address: The 10th Anniversary International Meeting on Simulation in Healthcare Lecture: At the Threshold of a New Frontier

"Quality, Safety & Reform: An AMA Perspective"

James Rohack, M.D. , President, American Medical Association/USA

Keynote Presentation: *"Why Hospitals Don't Learn From Failures: Organizational and Psychological Dynamics That Inhibit System Change"*

Amy Edmonson, Ph.D.

Psychological safety, teamwork and enhancing team learning behaviors are at the heart of healthcare simulation. This session presents concepts and empirical findings related to learning during ongoing health care delivery operations and explores implications for enhancing learning that occurs in simulation experiences.

EP4.01: Hot Topics in Pediatric Research Expert Panel

Faculty: Mark Adler, M.D.

EP4.02: ISBMS: International Symposium on Biomedical Simulation Expert Panel

Faculty: Fernando Bello, Ph.D.

EP4.03: Oral Presentation - Award Winning Research Abstract Submission in Patient Related Outcomes, Research in Simulation, Including Patient Safety. Using Simulation to Orientate Operating Department Staff and Test the Safety and Usability of a New Hospital Operating Suite Expert Panel

Faculty: Miriam Canham, Mb.Ch.B., FANZCA, David Pirotta,
Mb.Ch.C., FRCA, Brian Robinson, Ph.D.

Simulation provides a useful quality and safety methodology in the orientation of staff to a new surgical complex, indicating problems with the usability of new areas. It is also predictive of the events that subsequently occur. This presentation highlights the use of simulation in preparing surgical staff for a move into an entirely new area.

EP4.03: Oral Presentation - 1st Runner Up Research Abstract Submission in Patient Related Outcomes, Research in Simulation, Including Patient Safety.

Use Of A High Fidelity Simulation Team Training Program In Obstetric Anesthesiology to Uncover Deficiencies In Resident Competencies and Curriculum Design Expert Panel

Faculty: David J. Birnbach, M.D., M.P.H., Eduardo Salas,
Ph.D., Ilya Shekter, M.S.

As part of the authors' obstetric anesthesiology resident education program, all residents participate in two separate high fidelity simulation training sessions. Residents who have previously completed two months of obstetric anesthesiology training and the introductory simulation sessions are provided with an advanced scenario consisting of the management of a high risk emergency in a parturient with a "difficult airway". As part of the scenario, the patient is already in the operating room when the anesthesia team is called and unbeknownst to the participants, the suction has been disconnected and the laryngoscope bulb loosened. The training focuses on communication skills, teamwork, and leadership. Videotape analysis revealed several unexpected performance deficits, which were readily identified by reviewers. A checklist was devised based on these behaviors, and then previously filmed

sessions were reviewed and judged to quantify these deficiencies.

EP4.03: Oral Presentation - Honorable Mention Research Abstract Submission in Patient Related Outcomes, Research in Simulation, Including Patient Safety.

Transportable Enhanced Simulation Technologies for Pre-Implementation Limited Operations Testing in the Neonatal Intensive Care Unit.

Faculty: Jesse Bender, M.D., Stephanie Adam, R.N., Mary Ann Garrin, R.N., Karen Kennally, R.N., Robin Shields, R.N.C., John Tanner, R.N.

Migration of a Neonatal Intensive Care Unit (NICU) to a new physical plant incurs many challenges, which are amplified by switching the culture of care to single family rooms from a bay type model. Healthcare delivery systems must be altered to maintain their efficiency and safety nets. Simulation offers a milieu to explore systems fallibility without exposing patients. Expanding upon similar endeavors in other healthcare settings, three authors implemented a TESTPILOT program prior moving from an existing 10,000 square foot facility to the nation's largest single family room NICU.

EP4.04 Operations Track: I am in the Process of Building or Expanding a Simulation Center Expert Panel

Faculty: Guillaume Alinier, M.Phys., P.G.Cert., C.Phys., M.Inst.P., M.I.P.E.M., F.H.E.A., Jordan Halasz, Connie Lopez R.N. M.S.N., C.N.S., R.N.C., John Vozenilek, M.D., F.S.M.

This panel will offer presentations and discussions about setting up and designing a simulation center. Working with architects, contractors, and institutional estate services, optimizing space utilization, and avoiding other people's mistakes are just a few of the topics that will be covered.

RT4.01: Houston, We Have a Mission: Building & Sustaining a Multidisciplinary Hospital-Based Simulation Center Round Table Discussion

Faculty: Jennifer Arnold, M.D., M.Sc., Francine Kingston, M.S.N., R.N.-B.C., Kelly Wallin, M.S., R.N.

The session will be a true round table discussion facilitated by the moderators. The moderators will pose focused questions and generate discussion with the aid of the Audience Response System results. Questions will focus on topics related to development, sustainability, and growth of a multidisciplinary, hospital-based simulation center including operations (staffing, technology, facilities, organizational support, funding, metrics, mission, vision), research and scholarly activity (how to support, funding), and key

stakeholders, collaborators and champions. Experts in the field of simulation who have been successful in development of hospitalbased multidisciplinary simulation centers will be invited to participate in the discussion.

RT4.02: Development of Special Interest Networks in Simulation

Round Table Discussion

Faculty: Adam Cheng, M.D., FRCPC, FAAP, Brendan Flanagan, M.D., Vicki R. LeBlanc, Ph.D., Michael Seropian, M.D.

Participants attending this roundtable will learn about 4 current networks/collaborative programs in simulation. The leaders of these networks will help facilitate discussion in several smaller breakout groups, where roundtable participants will explore various aspects related to simulation-based networks/collaboratives. The main goals of this roundtable are to discuss the benefits, challenges and lessons learned in the development and maintenance of simulation networks, and to look forward to the future to determine what sort of new collaboratives need to be formed to help advance simulationbased education and research.

WS4.01: Teaching Family-Centered Care within High Stakes Clinical Environments via Simulation: Demonstration of Three Approaches Incorporating Whole-body Mannequin Simulation and Relational (Actor)-based Methodologies

Workshop

Faculty: Elaine C. Meyer, M.D., Gavin Hayes, B.S.N., Robert Pascucci, M.D., Christine Rachwal, R.N., M.S.N., Bethany Trainor, R.N., B.S.N., Peter Weinstock, M.D., Ph.D.,

This interactive workshop will review the benefits and obstacles to family-centered care with an emphasis on the growing trend to have parents at the bedside during routine care and invasive procedures. Guided by workshop faculty, participants will spend approximately three-quarters of the time engaged in small group hands-on activities. Groups will apply learned concepts and strategies to the development of scenarios based on specific learning objectives and student demographics (expertise level). Participants will then have the opportunity to participate in a selected family-based scenario that will be demonstrated in three forms using different improvisations of parent-actors as well as titration of emotional inten.

WS4.02: It's a Validity Thing: Producing Measures That Count

Workshop

Faculty: Ann M. Willemsen-Dunlap

This workshop will engage participants in the process of identifying constructs of importance within a scenario and evaluating techniques for examining the construct validity of measures generated by simulation.

WS4.03: From Movies to the Clinical Skills Centre: Enhancing the Realism of Hybrid Simulation Workshop

Faculty: Dominic King, M.B., Ch.B., M.Ed., M.R.C.S., B.Sc.,
Sonal Arora, M.B.B.S., B.Sc., M.R.C.S., Fernanco Bello, Ph.D.,
Max Cambell, Ara Darzi, M.D., F.Med.Sci, F.R.C.S., Eva
Kassab, M.Sc., Roger Kneebone, Ph.D. FRCS, Debra Nestel,
Ph.D., Nick Sevdalis, Ph.D.

As the concept of 'learning by doing' has become less acceptable, medical educators have been prompted to seek alternative methods for teaching procedural skills. Simulation offers obvious benefits, but such training experiences must remain rooted in actual practice. This workshop will illustrate how the use of virtual reality and benchtop models, in conjunction with actors (standardized patients) can create effective human simulator hybrids in a clinical setting. While technology for simulating clinic encounters has improved dramatically in the last decade, many physical models in clinical skills centers lack effective realism and do not meet the needs of educators and trainees. Television and film sets use prosthetic artists to create highly realistic simulations of injuries and clinical encounters. Such technology provides extremely high levels of perceived realism and encourages suspension of disbelief. Our multidisciplinary research team of clinicians, educators, design engineers and prosthetics specialists from the film industry have developed a range of realistic models for teaching and assessment of surgical and procedural skills. These include seamless alignment of models with actors to (or simulators) to create hybrid simulations. The workshop will demonstrate a range of examples, using this as a springboard for discussing issues around achieving procedural realism through advanced simulation design.

WS4.04: Optimizing the Educational Value of Standardized Patients' Feedback to Medical-Simulation Trainees Through Structured Training - The MSR Model Workshop

Faculty: Liat Pessach, Tal Rachamim, Orit Shalomson, Amitai
Ziv, M.D., M.H.A.

A powerful educational element of simulation-based medical education (SBME) is the feedback provided by simulated/standardized patients (SPs) to the trainees on how they felt as patients/lay people during the simulation and how they perceived the communication skills of the trainees. Trainees often report that this direct feedback has a unique self reflection quality which complements the educational insights provided in the debriefing conducted by professional instructors. Thus, in order to optimize the impact of this feedback, MSR, the Israel Center for Medical Simulation has developed a special model for actors' feedback and a structured training for SPs where they learn how to provide a meaningful feedback to participants at the end of a simulated scenario. The unique and significant advantage of the

actors' feedback is to allow the trainees the unusual opportunity of examining how patients experience them directly, not through the eyes of the facilitator, spectator or examiner. The workshop is meant to familiarize participants with the key concepts in preparing actors to provide feedback after a simulated encounter, and the significance of actors' feedback as an important tool within the spectrum of simulated environments. The workshop will examine various feelings that patients are liable to experience during a medical encounter and will familiarize participants with a structured feedback model as well as with MSR's approach to structured SP training for this important role, as a mean to maximize and optimize its educational effect on simulation-based trainees.

WS4.05: Teaching and Assessing Competency in Difficult Communication Skills Workshop

Faculty: Donald J. Woodyard, B.S., Cherri D. Hobgood, M.D., F.A.C.E.P.

Competency in difficult communication skills is necessary for an array of health professionals. This workshop will help faculty design, teach, and assess these skills using interactive teaching techniques and standardized patients. Healthcare providers are required to communicate with patients and family members on difficult topics often without any formal training on how to conduct these conversations. Depending on the topic, certain pieces of information must be conveyed to the patient/family. Patients report that they prefer complete and transparent disclosure of information regarding their or their family members' care, including errors. Phase one of this workshop will examine the utility of developing learning tools such as mnemonics to create an easily remembered list of important topics that must be covered during any difficult communication encounter. Content will address not only the information transfer but methods for conveying that information in an empathic manner and creating an empathetic environment for the patient/family to receive the news. The well studied GRIEV_ING method to teach faculty how to develop these skills in the learners will be used. Faculty will participate in role play and debriefing to learn coaching and formative feedback techniques. Phase two of the workshop will look at assessing the learners on the competencies taught in the interventions, examining how to create a checklist and relationship/communication instrument. We will discuss summative and formative formats for assessment and will teach the participants how to train standardized patients to both play the role of the patient/survivor and complete accurate checklists. Videos of standardized encounters and a live action encounter with a standardized survivor will be reviewed. Participants will volunteer to disclose the error to the standardized survivor and then to openly discuss the live action encounter with the large group. Small groups will then develop a behaviorally anchored checklist based on a difficult communication and demonstrate it for the large group. Participants will have discussion after each demonstration. The workshop will close with summary/discussion.

WS4.06: Make the Most Out Of the ACS/APDS Skills Curriculum: A Guide to Its Effective and Efficient Implementation Workshop

Faculty: Andreas H. Meier, M.D., Neil H. Seymour, M.D.,
Dimitrios Stefanidis, M.D.

The increasing number and complexity of procedures surgery residents have to master today within the constraints of the 80-hour workweek along with ethical concerns of practicing on patients have forced surgical educators to identify additional venues for training. Simulators are playing an increasingly important role in surgical education. They allow repetitive and deliberate practice in a safe and non-threatening environment enabling trainees to overcome the learning curves of new skills and procedures before applying them on patients. By moving the learning curve outside the operating room, surgery residents are better prepared and more confident when they perform procedures on patients. As a result, one of the new residency review committee requirements is that surgical residency programs provide their trainees access to a skills center. Even though most institutions today provide such access, many general surgery programs are struggling with the educational content of the skills curriculum. Based on this need, the American College of Surgeons (ACS) and the Association for Program Directors in Surgery (APDS) under the leadership of Dr. Dunnington at Southern Illinois University developed a comprehensive online skills curriculum to provide an educational activity template for programs to use in their skills laboratories. Yet, this comprehensive curriculum may still be challenging to implement and limited experience with its effectiveness exists.

The goal of this workshop is to familiarize the audience with the three phases of the curriculum, demonstrate their implementation in three institutions that have a national leadership role in surgical education and to provide an interactive exchange between the presenters and the attendees. In addition, we will present possible incentives to attract faculty to participate and address staffing needs of the skills labs. Furthermore, we will provide suggestions regarding the assessment of the curriculum's effectiveness.

The workshop will follow the National Curriculum and cover each phase individually:

Phase I covers basic surgical skills. The needed equipment and supplies will be identified and personnel requirements addressed. Performance assessment for these modules will be examined.

Phase II deals with more complex surgical procedures and involves the use of animal labs and cadaver dissections. Challenges of resource allocation and implementation will be discussed.

Phase III provides content for surgical team training. The use of full patient simulation to deliver teamwork experiences will be discussed, along with the implementation challenges for these more complex lab-based methods.

After completion of this workshop, the newly acquired knowledge will allow participants to more effectively and efficiently implement the various components of the ACS/APDS national skills curriculum at their home institutions and simulation centers.

WS4.07: Incorporating Team STEPPS Within Simulation Events for CRM and Patient Safety Workshop

Faculty: Gail A. Burleson, Guillaume Alinier, M.Phys., P.G.Cert., C.Phys., M.Inst.P., M.I.P.E.M., F.H.E.A., T. Kent Denmark, M.D., FAAP, FACEP, Joey J. Failma, E.M.T.-B.

This workshop will introduce TeamSTEPPS and its use in the simulation environment. Key principles of the program, practice implementing TeamSTEPPS into a simulation scenario, and wrapup and discussion of the program's effectiveness will be included.

WS4.08: Evaluation Methods in Simulation Training for Invasive Procedures Workshop

Faculty: Leigh V. Evans, M.D., Timothy Clapper, Kelly L. Dodge, M.D., Haru Okuda, M.D., Tanya D. Shah, M.D.

Despite increasing mandates for accreditation bodies to ensure procedural competence, standardized measures do not exist to assess competence in invasive procedures such as central venous catheter (CVC) insertion. Current assessment tools include global rating scales and the use of checklists. Competency has been evaluated for performance on simulated partial task trainers while few assessments have been performed on actual patients. This workshop will explore the advantages and disadvantages of global rating scales, direct observation with independent raters and videotape review using the model of ultrasound guided CVC insertion. The workshop is designed to introduce participants to videotape review and direct observation of invasive procedures by using a 50 point procedural checklist for CVC insertion developed for an AHRQ funded study to assess performance in the clinical setting at Yale University. This checklist is also used for CVC insertion training at the Institute for Medical Simulation and Advanced Learning in New York. Participants will complete the checklist while watching videotapes with choreographed technical errors and have the opportunity to perform CVC insertion on a partial task trainer with direct observation and completion of the checklist by other participants. Inter-rater reliability will be addressed as well as how to design checklists for other invasive procedures.

EP4.05: Developing Tools for Simulation Evaluation: Advice From the Trenches Expert Panel

Faculty: Suzan E. Kardong-Edgren, Ph.D., Jacqueline Arnold, R.N., Deborah Henderson, Pamela Jeffries, Judy LeFlore, Patricia Ravert, Shelley Reed

Simulation faculty with recent tool development experience will lead a discussion surrounding tool development for simulation. Samples of tools will be shared with the participants. Methods for developing and evaluating the reliability and validity of tools will

be shared by all participants. Participants are asked to bring copies of their simulation evaluation tools, current or in production, to share with the group. Participants are also asked to bring business cards to exchange as they meet others to collaborate with, in tool development, during the speed networking phase of the round table.

EP4.06: Innovative Applications of Pediatric Simulation Expert Panel

Faculty: Kristin Nelson

EP4.07: Oral Presentation - Award Winning Research Abstract Submission in Human Factors-Oriented, Simulation-Based Research.

Does the AHA Bradycardia Algorithm Encourage Inadvertent Administration IV Bolus of Epinephrine during Treatment of Symptomatic Bradycardia?

Expert Panel

Faculty: Moderator: Kianoush Kashani, M.D. Authors: Paul Cash, B.S., L.P., Leonid Bunegin, B.S., Anthony Sperduti

The AHA Bradycardia Algorithm recommends that atropine be considered for initial treatment of sinus bradycardia and low degree blocks. If ineffective, intravenous infusion of epinephrine or dopamine is suggested while awaiting TCP. Unfortunately, the order and bolus of Epinephrine and Dopamine may cause some confusion resulting in the administration of 1mg of epinephrine as a rapid IV bolus instead of an infusion. This study addresses the potential for administration of a rapid IV of epinephrine during treatment of symptomatic bradycardia in a high fidelity human simulator.

EP4.07: Oral Presentation - 1st Runner-Up Research Abstract Submission in Human Factors-Oriented, Simulation -Based Research.

The Effect of Visual Cues On Hand Hygiene Compliance in a Simulated Environment

Expert Panel

Moderator: Kianoush Kashani, M.D. Authors: David J. Birnbach, M.D., M.P.H., Ruth Everett, M.S.N., Maureen Fitzpatrick, M.S.N., A.N.R.P., Joshua D. Lenchus, D.O., R.Ph., Jared Mait, Igal Nevo, M.D.

Poor hand hygiene (HH) is the single most important risk factor of healthcare-associated infection (HAI) that affects patients worldwide. This quasi-experimental controlled study assessed the efficacy of four different visual cues on hand hygiene compliance (HHC).

**EP4.07: Oral Presentation - Honorable Mention
Research Abstract Submission in Human Factors-
Oriented, Simulation-Based Research.**

***Situation Awareness Queries as an Objective Measure of
Performance in Simulated Handoff Communication***
Expert Panel

Faculty: Moderator - Kianousch Kashani, M.D. Authors -
Jerome G. Chen, M.D., Kahitji P. Mistry, M.D., M.Sc., Phillip
B. Smith, M.D., M.H.S., David A. Turner, M.D., Melanie C.
Wright, Ph.D.

Research on communication in health care has focused on
information delivery, but few studies have examined ways to improve
understanding. For children undergoing cardiac surgery, the handoff
process from the operating room to the pediatric intensive care
unit (PICU) represents a high-risk period when accurate, efficient
communication is vital. The objective of this study was to apply
simulation to validate a measure assessing provider understanding
following handoff communication. The authors hypothesized that
physicians and nurse practitioners (NP's), with their advanced
medical training, would score higher than bedside nurses.

**EP4.08: Operations Track: We've Just Built a
Simulation Center - Now What??**
Expert Panel

Faculty: Tom Dongili, Carolyn Masters, Robert A. Moore,
M.B.A., EMT-P, Ian Saunders, Cer.A.T.

Included in this session will be presentations and discussions about
the efficient and sustainable utilization of your simulation center.

**IP4.01: SSH Certification: What it Can Mean for Your
Career**
Informational Panel (no credit offered)

**RT4.03: The Specifics of a Pre-Hospital Simulation, Not
so Special After All**
Round Table Discussion

Faculty: Helge Lorentzen, RN., Olli Vaisanen, M.D., Ph.D.

The purpose of this session is to discuss the possibilities of prehospital
simulation as well as the difficulties one may have when
planning and running pre-hospital simulation training. Faculty
will also challenge the question that pre-hospital simulation
differs significantly from in-hospital simulation. After four short
(and slightly provocative) presentations, there will be a 50 minute
discussion with the audience. ARS will be used to find out the
opinions of the audience.

SW4.01: Simwars Immersive Course

Faculty: Steven A. Godwin, MD, Haru Okuda, MD

Simwars is an interactive simulation competition that allows teams of clinical providers to compete against each other on simulated patient encounters in front of a large audience. An expert panel will judge each team's performance in areas such as teamwork, communication, and leadership as well as in the medical management of the "patient". The audience will vote on the winner of each case using the audience response system based on their direct observation and the panels' input. Each encounter will be recorded by an advanced AV system that can capture multiple views of the simulation and merge with the physiological input. Ultimately there can be only one 2010 IMSH Simwars Champion.

WS4.09: Train the Trainer - the MSR Model of Instructor Training Workshop

Faculty: Liat Pessach-Gelblum, B.A., Orit Shalomson, Amitai Ziv., M.D., M.H.A.

Instructors or trainers in SBME are expected to possess debriefing and facilitation skills that are unique to simulation-based environments, in addition to being content experts in the relevant field of medicine. They must be familiar with the simulated scenarios and their educational aims as well as the debriefing points designed for each scenario. Furthermore, they have to master debriefing skills (with or without the use of audio visual tools) in order to facilitate constructive group discussions during the debriefing sessions that follow the simulated encounters. Therefore, hands-on exposure of newly recruited instructors to the concepts and principles of SBME accompanied with a formal and structured training in debriefing techniques plays a major role in developing faculty into becoming effective and potent simulation-based instructors. The aim of this workshop is to introduce the concept and principles of the "train the trainer" process, and to supply participants with a recommended workshop curriculum that can be adapted for different SBME contexts. The session will demonstrate a mini train the trainer workshop and will include a component of actual practice, thus enabling participants to experience the process firsthand.

WS4.10: Debriefing in The Real World: Practical Debriefing Techniques Workshop

Faculty: Zeev Friedman, M.D., Viren N. Naik M.D. M.Ed.,
FRCPC, Deven Chandra, M.D., M.Ed., FRCPC

This session is designed to provide a practical approach to debriefing following a simulation experience. This practical session will complement the debriefing theory presented earlier in this conference. Participants will know the importance of integrating

human factors and crisis resource management as learning objectives into a simulation curriculum for improved patient safety. Participants will practice a variety of different debriefing techniques to optimize their teaching effectiveness.

WS4.11: Propelling Scholarship: From Inception of a Simulation Curriculum to Publication through MedEdPORTAL Workshop

Faculty: Sara Kim, Christopher Candler, M.D., Julie Metner, M.D., Jennifer Reid, M.D., Robby Reynold, M.P.A., Brian Ross, M.D., Ph.D., Michael Salah, Kimberly Stone, M.D.

This is a joint workshop by the University of Washington Institute for Simulation and Interprofessional Studies (ISIS) and AAMC (Association of American Medical Colleges) MedEdPORTAL. ISIS is a leading simulation training center with more than 20 simulation curricula developed based on a structured curriculum development process. MedEdPORTAL is the most widely recognized international peer-review system established by AAMC. Educational curricula published in MedEdPORTAL are acknowledged by U.S. medical schools as scholarly activities for academic advancement. This workshop targets two groups: (a) clinicians who are new at simulation-based curriculum and who have interests in promoting curriculum as scholarly products; and (b) educators who collaborate with clinicians in curriculum development. Clinical educators often lack formal training in curriculum development and can benefit from faculty development in this area. The primary goal is to lead participants through a process for developing and preparing a curriculum for rigorous peer reviews and publication in MedEdPORTAL.

WS4.12: Large Scale Medical Simulation as a SimCity Challenge - Development, Planning, Operation and Debriefing with Comprehensive Software Support - The MSR Model Workshop

Faculty: Ravid Segal, B.Sc., Kim MacMillan, M.B.A., Liat Pessach-Gelblum, B.A., Amitai Ziv, M.D., M.H.A.

The workshop will demonstrate the challenges in running and operating a large scale simulation center and how designated software can support the course development, planning, resource allocation, actual operations and debriefing. The workshop is aimed at all sim center staff members – healthcare professionals/educators, technology experts and administrative team. The audience will be actively involved in simulated exercises through which they'll be exposed to all aspects of building various simulation-based courses including: course objectives, simulation-based scenarios and curricular needs, space requirements, simulators, operators, standardized patients (SPs), instructors, technological and administrative requirements etc. Simulated exercises will enable

participants to actively engage with the newly developed MSR's support software which highlights the building blocks of large scale simulation activities.

WS4.13: Creating Educational Videos Using Simulation Workshop

Faculty: Martin P. Eason, M.D., J.D., Sean Cavanaugh, David Currier, Ph.D., Christopher Gallagher, M.D., Dawn S. Tuell, M.D.

Given duty hour restrictions, both trainees and instructors have ever decreasing time for teaching. Efforts to increase teaching efficiency of instruction should be made. With each new group of learners, the teaching sessions are usually repeated thus wasting efforts. Moreover, this requires the presence of both learner and instructor at the same time and place to share the instructional experience. One way to avoid repetition of efforts is to record and archive the lessons. This will allow trainees to view the materials at a place and time of their choosing. This workshop will focus on the recording and archival of simulation training videos. While many institutions do record their lectures and teaching sessions with the help of their audiovisual departments, not all institutions have that availability. There are some available sources of teaching videos on the internet, but not all cover a particular subject matter desired by an institution nor are they customized to an institution's needs. With the availability of inexpensive yet relatively high quality recording equipment, as well as video editing software, instructors can be taught a simple method to create training videos using simulation equipment already available at their institutions. Additionally, if created in the proper format, they can be uploaded to a website and viewed by their target audience. Simulators offer an advantage in that they allow the repeated recording of sessions (e.g. numerous takes) until an acceptable training video is obtained. As more videos are created, they can be shared with other institutions to foster a community of shared educational materials.

WS4.14: The Business of Simulation Is There A Return on Investment (ROI)? Workshop

Faculty: Pamela A. Boyers, M.D., Carol Hasbrouck, M.A., Benjamin Stobbe, A.D.N., B.S.B./M.

This workshop will provide an overview of the capital and operational costs of simulation centers. The challenges of funding and supporting simulation centers will be reviewed. During small group discussion, attendees will be asked to share how the financial support for simulation is being addressed in their institution, to articulate how/if the Return On Investment (ROI) issue is being studied and how the ROI for simulation is being articulated to the leadership of the organization.

EP4.09: Addressing Clinical Placement Shortages: Pediatrics as a Case in Point Expert Panel

Faculty: Judith Lambton, Ed.D., R.N., Paula Gubrud-Howe, Ed.D., R.N., Pamela Jeffries

Pediatric clinical sites are extremely difficult to find for a multitude of reasons today. The few available are frequently lacking in meaningful educational experiences for nursing students. Simulation may provide a necessary alternative to traditional pediatric clinical. These experts will provide background and discuss their experiences with pediatrics simulation as a substitute for clinical.

EP4.10: Using Behavioral Marker Systems (ANTS & SPLINTS) To Rate Performance of Personnel Expert Panel

Faculty: Lucy Mitchell, Rhona Flin, Ph.D., Rona Patey, M.D.

This session will introduce the concepts of non-technical skills and the method of developing the rating systems and their applicability to clinical practice. Attendees will be provided with an introduction to some background and non-technical skills definitions before partaking in an interactive session. This will involve viewing simulated scenarios with the opportunity to use the rating systems to rate the behaviours seen in the clips, and to discuss the ease or difficulty of using the systems. EP4.11: Skills for Trainees and Academic Researchers in Simulation (STARS): Defining the Needs, Challenges and Resources Available for Inexperienced Researchers

RT4.04: Conversations on Inter-professional Education Simulation Experiences Round Table Discussion

Faculty: Andrew Booth, PA-C, Deborah Bambini, Ph.D., WHNP-BC, Margaret de Voest, Pharm.D.

It is well documented, both nationally and internationally, how important inter-professional education (IPE) is in improving patient outcomes. The Institute of Medicine, Joint Commission, and other organizations intent on improving patient safety have developed goals and standards for safety and quality of care. These organizations have emphasized the importance of IPE as a means to reaching these goals. Several studies support that better inter-professional relationships are linked to improved patient outcomes. Traditionally, healthcare professionals are educated in silos, but expected to perform as cohesive team members upon graduation, without the knowledge or skills to do so effectively. This session will highlight how simulation provides an avenue for teaching and practicing the skills necessary to achieve improved inter-professional communication and understanding.

RT4.05: Building Adaptive Infrastructure for Successful & Sustainable Simulation Programs

Round Table Discussion

Faculty: Jane Lindsey Miller, Ph.D., Robert Sweet, M.D.

As health science simulation professionals, we are responsible for ensuring simulations of procedures and scenarios that teach and test the best of (evidence-based) clinical practice. Whether we are clinicians or social scientists, we advocate strategies (e.g. deliberative practice, time outs, closed-loop communications) that have been shown to be effective in maximizing positive patient outcomes and minimizing the risk of systemic failure and/or medical error (Ericksson 2004; Issenberg et al 2005). However, we do not often apply the same logic to the organizational frameworks we create to support the work of simulations. We take great pains to match the actual conditions and expectations of clinical work in our simulations, yet the organization and coordination of that work often does not match the dynamism and the rapid rate of change within our academic institutions and health care systems (see Brown, Eisenhardt 1997). We aspire to improving the “adaptive expertise” of our learners – the ability to “approach new situations flexibly and to learn throughout their lifetimes” (Bransford, Brown, Cocking 2000:48). Yet, we do not apply lessons learned about the value of adaptive expertise to the structure of our simulation programs.

EP4.11: Skills for Trainees and Academic Researchers in Simulation (STARS): Defining the Needs, Challenges and REsources Available for Inexperienced Researchers

Expert Panel

Faculty: Peter Dieckmann, Ph.D., Sonal Arora, M.B.B.S., B.Sc. M.R.C.S., Nick Sevdalis, Ph.D.

The workshop will open with a brief introduction to the issues facing researchers from the perspective of a clinician who conducts simulation research. The audience will discuss existing needs and resources. Faculty will discuss with participants how the SSH is working to assist new researchers. The audience how best the Society can assist new researchers.

EP4.12: Operations Track: Our Center Has Been Set Up for Awhile. What are Others Doing?

Expert Panel

Faculty: Guillame Alinier, M.Phys., P.G.Cert., C.Phys., M.Inst.P., M.I.P.E.M., F.H.E.A., Benjamin W. Berg, M.D., Doris Ostergaard, M.D., M.Ed., Erick Stricker, M.Sc.

Panelists will give presentations and discussions about everyday issues faced by simulation centers of all sizes such as training of faculty, reducing expenditures, research projects, and diversification of activities.

IP4.02: How to Use the New SSH Website
Informational Panel (no credit offered)

WS4.15: Making it Real on a Shoestring: Practical, Budget-Friendly Ways to Enhance Realism in Ob-Gyn Simulation
Workshop

Faculty: Jenifer O. Fahey, C.N.M., M.S.N., M.P.H., Roxanne Gardner, M.D., M.P.H.

This workshop will highlight the concepts of realism and innovation in creating effective simulation scenarios. The issues of “nice to have versus need to have” and “how much realism is needed” will be addressed. Presenters will provide some general guidelines on how to determine whether modifications or innovation is necessary and/or will enhance learning. Presentations will be given that illustrate existing innovations and modifications to available simulators/mannequins in use at various centers. Participants will work in groups to propose solutions to the question of “how do you make scenarios more realistic/more able to meet teaching objectives?” Small groups will create an innovation “wish-list” that will help spring-board efforts to create these innovations either by members of special interest groups, industry or other simulation programs.

WS4.16: Designing Scenarios and Measurement Tools for Teamwork Skills Training
Workshop

Faculty: Michael Rosen, David Baker, Eduardo Salas, Ph.D., M.S., Sally Weaver, Teresa Wu

This workshop will introduce a methodology for designing scenarios and measurement tools for simulation-based training for teams.

WS4.17: Simulation in Healthcare Workshop for Reviewers (and Authors)
Workshop

Faculty: Mark W. Scerbo, Ph.D., Jeffrey Cooper, Ph.D., David M. Gaba, M.D., Ronnie J. Glavin, M.B., Ch., M.Phil., S. Barry Issenberg, M.D., Demitrios Stefanidis, M.D., Ph.D.

The purpose of this workshop is to provide participants with tips and techniques for writing better manuscript reviews. This workshop is aimed at new and current reviewers, but is also relevant for potential authors. Participants who attend will gain a better understanding of expectations for: 1) reviews in general, 2) reviews of different types of papers, and 3) feedback to authors and editors. Participants will also have the opportunity to discuss several legal and ethical issues. Potential authors who attend will gain a better understanding what reviewers expect in a manuscript and what typical problems to avoid. Reviewers who attend will not only gain a better understanding of the expectations of authors and the editors, but will learn how to write better papers themselves. Workshop facilitators will be drawn

from the editorial staff of the Society for Simulation in Healthcare's (SSH) journal, Simulation in Healthcare. Active, highly rated reviewers will also serve as faculty. This workshop addresses a critical need within SSH as the society journal, Simulation in Healthcare, expands to 6 issues in 2010.

WS4.18: How to use the BAT: Assessment of CRMBased Behavioral Skills in Simulation Using a Validated, Reliable Tool Workshop

Faculty: JoDee M. Anderson, M.D., M.Ed., Kristine Boyle, N.N.P., Glenn DeSandre, M.D., Judy L. LeFlore, Ph.D., R.N., NNP-BC, Douglas T. Leonard, M.D.

The purpose of this workshop is to provide an interactive overview of the Behavioral Assessment Tool (BAT) as it pertains to behavioral performance assessment in the simulator. Crisis Resource Management (CRM) principles have been used to identify, define, teach and assess the behavioral skills required for effective performance during medical emergencies. The BAT is a validated, highly reliable tool (established in multiple investigations) derived from the principles of CRM.

Appendix 5: Wednesday Programming with Descriptions

EP5.01: Medico-Legal Implications of Video Storage of Health Provider Performance Expert Panel

Faculty: John Vozenilek, M.D., F.S.M.

Video-assisted debriefing as a component of simulation-based education has become more widespread. Digital media and its ease of long term storage and potential for dissemination make videos of learners' performance raises several important question. The medico-legal implications of video storage are not clear and educators and institutions need guidelines as to how to deal with this aspect of simulation-based training.

EP5.02: Winning Over the Education Commissioners Expert Panel

Faculty: Ian Curran, Paula Gubrud-Howe, Ed.D., R.N., Katie Walker, R.N., R.M.

Increasingly, healthcare educators are integrating simulation into existing curricula. In many instances, alterations in these formal training programs involve convincing key oversight stakeholders of the value added by simulation-based training to justify necessary funding streams. During this session, we will explore both sides of this issue to prepare attendees to engage in these important discussions.

EP5.03: Oral Presentation - Award Winning Research Abstract Submission in Emerging and Innovative Methods and Technology. Mathematical Model for Simulation of Early Decelerations in Labor. Expert Panel

Authors: Marieke B. van der Hout-van der Jagt, Peter H. M. Bovendeerd, Ph.D., Swan G. Oei, M.D., Ph.D.

Medical simulation training of obstetric teams is becoming more common. Existing birthing simulators, however, do not have a model-driven system to provide the cardiotocogram (CTG) during delivery. The authors extended their circulation model of fetus, mother and placenta with a CTG with early decelerations. The model links head compression in labor to early decelerations in the CTG trace. The model gives an estimate of the cerebral flow reduction that occurs during early decelerations, including an estimate for vessel diameter reduction in the brain. Validation results via expert opinions will be presented during this presentation.

EP5.03: Oral Presentation - 1st Runner-up Research Abstract Submission in Emerging and Innovative Methods and Technology.

Evaluation of Respiratory Mechanics on the METI ECS, METI HPS, and Laerdal SimMan Full-Scale Simulator Mannequins
Expert Panel

Authors: David Liu, B.E. (HONS), Lara Brewer, Dylan Campher, Simon A. Jenkins, M.B.B.S., FANZCA

Simulations often require participants to provide respiratory support, but there is little research on the fidelity of respiratory mechanics in full-scale simulator mannequins. This study compared factors such as chest expansion, ventilation, compliance and resistance.

EP5.03: Oral Presentation - Honorable Mention Research Abstract Submission in Emerging and Innovative Methods and Technology.

Virtual Infant Patients, Families, and Staff Collaboration: Simulating Situational Medical Scenarios with a Virtual Living World
Expert Panel

Authors: Judy L. LeFlore, Ph.D., R.N., NNP-BC, Carolyn Cason, Ph.D., R.N., Monica Evans, Ph.D., Marge Zielke, Ph.D.

Medical training simulations mirroring the immersive environment of commercial video games offer benefits superior to physical mannequins. These include the ability to quickly and accurately produce numerous low-volume/high-risk medical situations, the opportunity to practice frequently and obtain feedback privately in a variety of situations and the potential to virtually encounter different patient, family and staff behaviors and cultures. The authors have created a new type of virtual training, driven by behavior and cultural models. A recursive platform for the development and visualization of dynamic socio-cultural models in medical situations was used. The model integrates visualization, sound design, and behavioral/cultural modeling with recursive assessment tools to create a living world that is sensory and culturally realistic. Key elements of the living world are the virtual infant patient, the virtual family and the virtual staff.

EP5.04: Collaborative in Simulation - Can You Afford NOT to be Part of One?
Expert Panel

Faculty: Michael Seropian, M.D., Susan Brien, M.D., FRCPC, Paula Gubrud-Howe, Ed.D., R.N., Katie Walker, R.N., R.M., K.T. Waxman, D.N.S., Dieter Zimmer

The flurry of collaboratives nationally and throughout the world is impressive. Each year we see more collaboratives form where

members perceive value in developing simulation capacity and programs with others across disciplines. This expert panel will not be your usual PowerPoint session – it will be your opportunity to actively participate with leaders in the field and see if they can answer your most pressing questions about collaboration in simulation. You cannot afford to miss this!

IP5.01: How to Use the New SSH Website Informational Panel (no credit offered)

RT5.01: Is High Tech Simulation High Fidelity Simulation? Round Table Discussion

Faculty: Gerald Moses, M.D., Mark Bowyer, M.D., Howard Champion, M.D., Mark W. Scerbo, Ph.D., F. Jacob Seagull, M.D.

A panel of experts in simulation training will define critical factors related to the topic; including fidelity, low-tech, high-tech, performance measures, and transfer of training. Attainable metrics for low-and high-tech simulators will be discussed. The relative merits of each level of technology will be compared in relation to fidelity of the training experience.

WS5.01: Bringing Crisis Resource Management (CRM) to Life: CRM Scenario Making in Movie Director Mode Workshop

Faculty: Peter Dieckmann, Ph.D., Ronnie J. Glavin, M.B., Ch.B., M.Phil., Steve Howard, M.D., Doris Østergaard, Marcus Rall, M.D.

Building scenarios that are learning-goal oriented is a challenge for many simulation instructors, particularly when it comes to building scenarios aimed at issues of crisis resource management (CRM). Movie directors use the “material” they have to trigger perceptions, emotions, thoughts and interpretations for entertainment. Scenario directors create scenarios to trigger perceptions, emotions, thoughts and interpretations to create learning opportunities. The goal of this workshop is to have participants switch their perspectives during scenario design from one of “what CRM issues can we discuss in our scenarios?” to “what CRM-triggering aspects do we want to build into scenarios”? This shift in perspective will help participants directly develop CRM-oriented learning opportunities in relation to the learning goals. Based on the metaphor of movie making, this workshop explores possibilities of building CRM aspects into scenarios. Several examples from feature films will be analyzed for building blocks and principles that are applicable to the design of scenarios (e.g. creating tension, focusing attention, using signs and symbols, exposition of the figures). The presenters will develop CRM triggering situations and processes that can be build into scenarios (e.g. new people entering the scene, differences in information about the scenario in the different people). Workshop participants will build CRM into scenario drafts provided by the faculty. Participants will work in small groups and present their ideas to the plenum. The faculty will facilitate the discussions.

WS5.02: Creating and Using Branching Virtual Patients with Open Labyrinth Workshop

Faculty: Rachel H. Ellaway, M.D., David A. Topps, M.B.Ch.B.

Onscreen simulation has tended to be a specialist and somewhat niche undertaking. This workshop introduces participants to new (and free) tools and techniques that allow anyone to develop powerful, interactive and highly flexible onscreen simulation environments based around narrative, gaming and decision-making. Opening up new ways of working with simulation modalities allows both those new to simulation and those running existing simulation programs to be able to extend and enhance their capacity and coverage. Those working with distributed programs where physical location and access can be challenging will find ways of bridging spaces, models and approaches.

WS5.03: Improving Debriefing Skills: Ways to Debrief and Coach the Debriefers *- Identical Workshop Offered Monday at 10:30 AM* **Workshop**

Faculty: Jenny Rudolph, Ph.D., Walter Eppich, M.D., M.Ed., Daniel Raemer, Ph.D., Robert Simon, Ed.D.

This workshop exposes participants to key methods for helping debriefers reflect on and improve their practice. The workshop utilizes both conceptual frameworks and practical exercises from the discipline of “reflective practice,” a rigorous approach to identifying and adjusting debriefers taken-for-granted assumptions and emotional reactions to improve their skill. The workshop shows how to break debriefing skills down into component parts to facilitate coaching and reflection, and allows participants to play the role both of debriefing trainee and debriefing instructor. The approach works well for either peer-to-peer coaching or advanced debriefer to less advanced debriefer coaching.

WS5.04: The Trade Game: The Use of Games to Develop Non-Technical Skills. **Workshop**

Faculty: Marcus O. Watson, Ph.D., Daniel Raemer, Ph.D.

The Trade Game is a cheap and fun approach to investigate Non-Technical Skills for groups of 15 to 120 people. The workshop will explore how games can be used to introduce behaviors of effective healthcare teams and explore debriefing methods. Participants will play and debrief The Trade Game, then deconstruct the game to examine how games can effectively be included in their simulations courses. A copy of the game will be provided for participants.

WS5.05: Demystifying Debriefing (or “Debriefing for the Common Man”) Workshop

Faculty: Lou Halamek M.D., Julie Arafah, R.N., M.S.N., Jesse Bender, M.D., Ritu Chitkara, Arnand Rajani, M.D.

Debriefing is viewed as a critical component of simulation-based training yet debate remains about what differentiates a “good” from a “poor” debriefing. During this workshop attendees view videotapes of scenarios paired with debriefings exemplifying good and poor debriefing skills, use a novel one-page tool to critique the debriefings, and join in a group discussion on how to (and how not to) debrief. The intent of this interactive workshop is to stimulate discussion about effective debriefing, refute “urban myths” about the process, illustrate simple and effective strategies for success, and provide members of the audience with the tools required to allow them to constructively and continuously evaluate their own debriefing skills as well as those of their colleagues.

WS5.06: TEST PILOT: Advanced Medical Simulation as a Tool to Assess New Clinical Settings and Systems Workshop

Faculty: Linda L. Brown, M.D., M.S.C.E., Leo Kobayashi, M.D., Frank L. Overly, M.D., FAAP

Implementation of new clinical environments or systems to an existing health care institution can result in many foreseeable problems. Some challenges, however, may only be detected after the change has been made, at which time patient safety may be compromised. In some institutions, on-site simulation has recently been used as a strategy to evaluate and optimize new clinical settings and systems prior to their use. This workshop will explore the use of advanced medical simulation as a tool to observe and assess new clinical locations and systems to help mitigate unexpected problems while change is still possible. The workshop will begin with a brief review of the medical literature and experiences at various institutions evaluating a new emergency department and neonatal intensive care unit. Ways to identify potential safety concerns will be introduced, including equipment and layout issues and communication and process gaps. A brief question and answer period will also be included.

PS5.01: Keynote Address: The Australian Frontier - The Evolving Story of a National Simulation Plan Downunder Plenary Session

Faculty: Brendan Flanagan, M.D.

In November 2008, the Council of Australian Governments (COAG) announced the allocation of 96M to the development and establishment of a national plan for Healthcare Simulation across Australia. The goal was to increase the capacity of the Australian Healthcare system to train the increasing number of healthcare

students and to ease the burden of scarce clinical placements within the public hospital system. An expert reference group was formed and the project outcomes, scope and methodology were agreed. The model was to be a curriculum led model whereby National agreement would be sought through the Councils of Deans of each profession and the accreditation bodies. Equitable access for healthcare students in regional and remote areas and interprofessional learning would be the foci. The project is progressing to plan and this is our story.

Appendix 6: Video Presentations

Simulation Cinema

The video sessions provide an opportunity for the medical simulation community to show and discuss a variety of simulation experiences that include case studies, unique teaching scenarios, virtual tours and a sampling of various simulation facilities. Each session will allow time for a panel discussion following the video presentation. Common themes will be presented together.

Monday, January 25, 2010

VS3.01 -Simulation Center Videos

10:30 AM - 12:00 PM

Faculty: Thomas Belda, BA, Pamela Leonard, RN

The Monday morning session will feature videos compiled in nursing simulation. Presentations are as follows:

Arizona State University College of Nursing

Presenter: Beatrice Kastenbaum, RN, MSN, CNE

Content: The video depicts students' journey to answering this question knowledgeably and confidently. Multiple learning strategies, including a unique interactive program that teaches fetal heart monitoring, and a pre-term labor simulation help students learn interpretation of EFM, careful surveillance of mother and baby, timely identification of complications, appropriate interventions, and activation of a team response.

The Dotson Simulation Lab Simmons College

Presenter: Josephine V. Atinaja-Faller, RN, MS, CNS

Content: Senior nursing students in Synthesis are applying information learned in the theory portion of their class into a clinical simulation scenario. The students perform a complete rule out myocardial infarction/chest pain protocol while applying culturally competent care to a female Muslim client while being screened for potential domestic violence. Other common complications in patient management are also being recognized which include arrhythmias, electrolyte imbalance, and initiate the code blue response system.

Fort Hays State

Presenter: Jenny Manry

Content: The video encompasses using simulation as a capstone experience for senior level students in a Baccalaureate program. It involves using the online learning software "Blackboard" transposed into an electronic charting program. Students are shown participating in the simulation and discussing debriefing regarding the simulation.

McMaster University

Presenter: Ruth Chen

Content: This video captures a unique model for simulation-based, undergraduate nursing education: students participating in an Intraprofessional team to manage a clinical event. Students from all four years of the program participated in the simulation while working within their respective nursing training level. The simulation provided rich learning opportunities for both junior and senior nursing students. Furthermore, Intra-professional team training has the potential to facilitate improved communication and enhance patient safety in future clinical practice.

University of South Carolina School of Nursing

Presenter: Erin McKinney, MN, RN

Content: Poor SBAR Communication. Scene where nurse gathers information from patient and relays vital sign information to practitioner. Nurse fails to deliver critical information to provider. Lack of information leads patient to an unfortunate outcome.

Baptist Memorial Center of Excellence in Healthcare Education, Union University

Presenter: Joy Thomason, Molly Wright, MS, APN, CRNA

Content: The simulation video that we are submitting is entitled “Simulation: Emergent Management of High Risk OB – A Multidisciplinary Approach”. A collaborative effort involving undergraduate nursing students, nurse anesthesia students, and a local obstetrician participated in this scenario. The obstetrical case begins involving a female with gestational diabetes that presents in normal labor but develops fetal bradycardia. Obstetrical exam reveals the presentation of prolapsed cord with fetal head cord compression, leading to emergency c-section.

VS3.02 -Simulation Center Videos

1:00 PM - 2:30 PM

The Monday early afternoon session will feature videos compiled in Teaching & Case Studies. Presentations are as follows:

University of Kentucky Department of Anesthesiology, UK Healthcare

Presenter: Aru Reddy, MBBS

Content: This video contains a portrayal of a simulation session held for 4th year medical students by the University of Kentucky Department of Anesthesiology. The goal of the simulated scenario was to introduce the management of an acute incidence where a medication error has been made.

Drexel University College of Medicine

Presenter: Heidi Baer, MD

Content: In this video, the placement of a temporary transvenous pacemaker (ttvpm) is reviewed utilizing an ultrasound to guide the placement into the right internal jugular vein. The format allows for both a text review while simultaneously providing a visual demonstration. This will help the novice acute-care provider successfully form a foundation to refer when a critically ill patient presents with a possibly life-threatening arrhythmia.

Kaiser Permanent San Diego

Presenter: Leslie Casper, MD

Content: This video documents two multidisciplinary team scenarios filmed during team training at our medical center. These team trainings incorporate nurses from L&D and NICU, RT, physicians from L&D and NICU, and CRNA and anesthesia staff. The training is performed over a 3 day period three times a year in situ in L&D. These scenarios include one vaginal delivery with abruption and one C-section due to previa with hemorrhage and maternal code.

Children’s Hospital of Philadelphia (CHOP) Center for Simulation, Advanced Education, and Innovation

Presenter: Roberta Hales.

Content: This video demonstrates Open Fetal Surgery (OFS) a high risk surgical treatment of the fetus with congenital abnormalities. OFS myelomeningocele is one surgery performed infrequently causing challenges to education and maintenance of competence of fetal surgery teams. In situ realistic simulation has provided an avenue for this multidisciplinary team to practice this procedure along with communication and teamwork training in a safe, nonthreatening learning environment.

University of England

Presenter: Todd Dadalaeres.

Content: Delivering bad News – Case Example using Standardized patient actor who plays the role of family member – receiving bad news from care team.

VS3.03 -Simulation Center Videos

3:30 PM - 5:00 PM

The Monday late afternoon session will feature videos compiled in Teaching & Case Studies. Presentations are as follows:

University of Massachusetts Simulation Center

Presenter: Brian Sweeney, MD

Content: Operative resection of rectum leads to presacral hemorrhage. Communication and technical skills evaluated.

Mayo Clinic - Surgical Simulation TEP Hernia Repair

Presenter: David Farley, MD & Ben Zendejas, MD

Content: Video Example of using a Task Trainer for performing Realistic simulation of Laparoscopic TEP Hernia repair.

Yale University School of Medicine, Department of Emergency Medicine Simulation Center

Presenter: Leigh V. Evans, MD & Kelly L. Dodge, MD

Content: A demonstration of the process of inserting a central venous catheter (CVC) under ultrasound guidance using a partial task simulator based on a 50-point procedural checklist that has been used in the hospital setting. From the process of properly setting up the ultrasound to suturing and dressing the CVC, the video breaks down the procedure into easily recognizable steps that makes learning CVC insertion straightforward. Also included are indications and complications of CVC insertion.

Saigh Pediatric Simulation Center - St. Louis Children's Hospital - The Simulation Centers at Washington University School of Medicine.

Presenter: James Fehr, MD.

Content: St. Louis Children's Hospital

Leaders created a video to promote The Joint Commission's recommendations to improve communication and identify potential patient safety factors. This video illustrates pre-procedure verification, interoperative time-out, and hand-off communication, stop the line for a contaminated field, stop the line for medication errors and a light-hearted look at video bloopers.

Tulane University

Presenters: Jennifer Calzada, James R. Korndorffer, MD.

Content: Louisiana Organ Procurement Agency conducted two days of training on recognizing appropriate organ donors and prepping patients for organ procurement.

VS4.01 -Simulation Center Videos

10:30 AM - 12:00 PM

The Tuesday morning session will feature videos compiled in Teaching & Case Studies. Presentations are as follows:

Kansas University

Presenter: Helen Connors, PhD

Content: Through the Academic Business Partnership between University of Kansas and Cerner Corporation we are currently using Cerner's Electronic Health Record in our curricula to plant the SEEDS of technology. This Simulated E-health Delivery System (SEEDS) is used throughout the School of Nursing, School of Medicine, and School of Allied Health transforming health

professionals' education. SEEDS provide an opportunity to learn and practice clinical skills while reaping the benefits of state-of-the-art environments promoting learning through technology.

Dartmouth Hitchcock Medical Center

Presenter: Tony M. Kidder

Content: "A Day in the Life" demonstrates the versatile uses and advantages of simulation through skill retention by following a fictional patient from time of injury to time of discharge. We attempt to highlight the many different things one can do in simulation when treating a trauma victim.

Hartford Hospital

Presenter: Steve Donahue

Content: This video contains a description of our simulation showing all aspects of simulation training from the baby to adult and central line placement.

Master Train San Antonio

Content: This video is an Advanced Cardiac Life Support Ventricular Fibrillation Evaluation Code. Master Train instructors; Paul Cash, Kathy Markowski, and Leon Bunegin, are strategically placed in specific locations in the code room to ensure student safety and evaluate individual skills and team performance. This video is one of our "Train the Trainer" series.

University of Dundee Scotland Skills Centre

Presenter: Jean Ker, MD

Content: The Postgraduate Ward Simulation Exercise (PgWSE) is a recognized method of assessing competence and providing constructive feedback as part of the national assessment framework for junior doctors who are experiencing performance issues. A PgWSE lasts for 20 minutes. The junior doctor will be expected to prioritize the care each patient receives whilst dealing with timed interruptions. A senior doctor and a nurse are available for advice. Realism is ensured through structured scripting of each PgWSE.

VS4.02 -Simulation Center Videos

1:00 PM - 2:30 PM

The Tuesday early afternoon session will feature videos compiled in simulation teaching examples. Presentations are as follows:

STAR Center West Penn Allegheny Health System

Presenter: Donald Wilfong, MD.

Content: This is a promotional video to show what our center has to offer to our employees, our affiliated hospitals, the community and for potential collaborations with other educational institutions, technical schools and businesses.

TACT Academy for Clinical Simulation India

Presenter: Ramesh Venkataraman

Content: TACT Academy for Clinical Training is India's first simulation based healthcare training center. Our first center was started in 2007 in Chennai, India and we now have two fully functional centers (Chennai & Coimbatore).

Texas Tech University

Presenter: Suzanne Escudier

Content: The purpose of this video is to creatively introduce a simulation program which has implemented educational standards recommended by experts from the Society of Simulation in Healthcare and the American Society of Anesthesiologists. The video shows instructors in the process of developing a scenario. Much information about the program is given through visual clues such as a container of confidentiality forms, a copy of Bloom's

taxonomy and a written reminder of an instructor training course.

University of Minnesota CREST Center

Presenter: Robert Sweet, MD

Content: A brief, detailed explanation of CREST's core research and development method for the creation of surgical simulators, predictability applications, and medical animations.

Wells Center (University of Colorado - Denver)

Presenter: Brad Runsel

Content: This video will provide viewers with an overview of our Critical Care Nursing course and how it helps address the nursing shortage in critical care. The video also explains how simulation and the visible human dissector are integrated to enhance learning. Additionally, the video includes commentary and feedback from class participants

Synergy Medical Advanced Practicum and Simulation Environment (SYNAPSE), Saginaw Michigan

Presenter: Steve Vance, MD

Content: This video features clips of various training sessions conducted at our center. High fidelity scenario training and task training sessions are featured, but photo stills are included from our PALS and ACLS courses as well. Learners shown include residents and medical students of Synergy Medical Education Alliance, as well as healthcare providers from local hospitals.

VS4.03 -Simulation Center Videos

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Clinical Skills Education & Testing Center - University of Oklahoma College of Medicine.

Presenter: Sheila M. Crow, PhD.

Content: This 12 minute video showcases the University of Oklahoma College of Medicine Clinical Skills Education & Testing Center (CSETC). The CSETC, which opened in February 2009, is a new 27,000-square-foot, state-of-the-art facility, where faculty and students work together in a safe, controlled and realistic medical environment that includes both human and computer-simulated experiences.

University of New England.

Presenter: Cynthia Morris.

Content: An informal introduction to the look and "feel" of the University of New England's Clinical Simulation Program. Created with a hand held FLIP video camera and edited in iMovie by Cynthia Morris-Coordinator of the Clinical Simulation Program (CSP), this video provides a glimpse inside the spaces, setup, systems and program user.

Abbott Northwestern

Presenter: David Tierney

Content: a combination of a video tour and live simulation & debriefing from a unique internal medicine resident focused simulation center.

Case Western Reserve

Presenter: Andrew Gross

Content: Brief overview of the facilities and the types of simulation tools we offer at the Center for Skills and Simulation at Case Western Reserve University.

Humber College, Toronto, Ontario

Presenter: Sandra Devlin-Cop

Content: Overview of simulation equipment, demonstration of clinical scenario with debrief included. Scenes from virtual clinical

learning environment which is part of the sim centre.

VS5.01 -Simulation Center Videos

8:00 AM - 9:30 AM

CAPE Center - University of Colorado Denver

Presenter: Joey J. Failma

Content: Introduction and orientation to the human patient simulator by the CAPE's Director of Simulation.

SMART Hospital - University of Texas Arlington School of Nursing

Presenter: Tiffany Holmes, DC. Content: The Smart Hospital™ is a 13,000 sq.ft. simulation and training hospital at The University of Texas at Arlington. This facility was outfitted by Hill-Rom, Inc., CareFusion, and Laerdal Medical Corporation with realistic, completely functioning hospital rooms, equipment and "patients" that collectively serves as a unique simulation center for clinical training. The submitted video is an overview of what the Smart Hospital™ has to offer.

STRATUS Brigham Women's Boston.

Presenter: Charles Pozner, MD

Content: The STRATUS (Simulation, Training, Research and Technology Utilization System) is dedicated to improving the quality and delivery of healthcare teaching teamwork and clinical decision-making utilizing simulation technology, medical education along with clinical and educational research. The STRATUS Center for Medical Simulation, employing simulation technology, medical education, teamwork development, along with clinical education and research, is dedicated to improving the quality and delivery of healthcare for providers at all levels.

University of Nebraska Sorrell Clinical Simulation Lab

Presenter: Patricia Carstens, MS

Content: A guided video tour of the Sorrell Clinical Simulation Lab and some of the equipment housed therein. This lab has only been open for one year and serves all educational disciplines, residency and the Nebraska Medical Center needs for simulation and deliberate practice. This lab has just recently become a certification testing center for the SAGES Fundamentals of Laparoscopic Surgery program.

Barnes Jewish College - Goldfarb School of Nursing

Presenter: Tina Ahearn, BSN, RN

Content: Marriage proposal to one of our nursing students during a Fundamentals course and scenario exercise this past summer when students were to provide therapeutic communication and perform wound care. This special event was also featured in our medical center's newspaper and supported by our academic deans.

Appendix 7:

Research Abstracts Presented at the 10th Annual International Meeting on Simulation in Healthcare

January 23–27, 2010 —Phoenix, Arizona

OVERALL BEST RESEARCH ABSTRACT

#157—Winner

Use of In Situ Simulations to Identify Barriers to Patient Care for Ad Hoc Multicultural and Multidisciplinary Teams in Resource-Constrained Settings

N. Shilkofski, E. Hunt

Johns Hopkins School of Medicine, Baltimore, MD

Best Trainee Research Abstract—#170

Central Venous Catheter Dress Rehearsal: Every Line Counts

A. Scholtz, A. Monachino, A. Nishisaki, D. Niles, E. Lengetti,
V. Nadkarni

The Children's Hospital of Philadelphia, Philadelphia, PA

EDUCATION, COMPETENCY AND ASSESSMENT

#005—Winner

Simulation-Based Training Improves Applied Clinical Placement of PICC Lines for Junior Radiology Residents

P. B. Andreatta, K. Cho, Y. Chen, M. Marsh

University of Michigan, Ann Arbor, MI

#017—Runner Up

Debriefing Assessment for Simulation in Healthcare (DASH): Assessment of the Reliability of a Debriefing Instrument for Use in the EXPRESS Study and Beyond

M. B. Brett-Fleegler¹, J. Rudolph², W. Eppich³, E. W. Fleegler¹,
R. Simon², for the EXPRESS investigators

¹Children's Hospital Boston, Boston, MA, ²Center for Medical Simulation and Harvard Medical School, Cambridge, MA, ³Division of Emergency Medicine, Children's Memorial Hospital, Northwestern University Feinberg School of Medicine, Chicago, IL

PATIENT RELATED OUTCOMES, RESEARCH IN SIMULATION, INCLUDING PATIENT SAFETY

#168—Winner

Using Simulation to Orientate Operating Department Staff and Test the Safety and Usability of a New Hospital Operating Suite

M. Canham¹, B. Robinson², D. Pirotta¹

¹Department of Anaesthesia and Pain Management, Wellington Regional Hospital, Wellington, NEW ZEALAND, ²National Patient Simulation Training Centre, Wellington Regional Hospital, Wellington, NEW ZEALAND

#162—Runner Up

Use Of A High Fidelity Simulation Team Training Program In Obstetric Anesthesiology To Uncover Deficiencies In Resident Competencies And Curriculum Design

D. J. Birnbach¹, I. Shekhter¹, E. Salas²

IMPACT OF SIMULATION CONTEXT AND PHYSICAL SETTING

#152—Winner

Lean Methodology Combined with In-Situ High-Fidelity Simulation to Evaluate Pediatric Emergency Department Design

L. Huang, D. Norman, D. LaForce, K. Anchala
McMaster Children's Hospital, Hamilton, ON, CANADA

#159—Runner Up

Identification of Medical Simulation Center Operational Characteristics at Children's Hospitals

D. A. Young¹, S. B. Issenberg²
¹Baylor College of Medicine, Houston, TX, ²University of Miami Miller School of Medicine, Miami, FL

HUMAN FACTORS-ORIENTED, SIMULATION-BASED RESEARCH

#165—Winner

Does the AHA Bradycardia Algorithm Encourage Inadvertent Administration IV Bolus of Epinephrine during Treatment of Symptomatic Bradycardia?

P. Cash¹, L. Bunegin², A. Sperduti¹
¹Master Train Center for Advanced Studies of Human Simulation, San Antonio, TX, ²University of Texas Health Science Center, Dept Anesthesiology, San Antonio, TX

#133—Runner Up

The Effect Of Visual Cues On Hand Hygiene Compliance In A Simulated Environment

D. J. Birnbach, R. Everett, M. Fitzpatrick, J. Mait, J. D. Lenchus, I. Nevo
University of Miami-Jackson Memorial Hospital Center for Patient Safety, University of Miami, Miami, FL

EMERGING AND INNOVATIVE METHODS AND TECHNOLOGY

#129—Winner

Mathematical Model for Simulation of Early Decelerations in Labor

M. B. van der Hout-van der Jagt¹, P. H. Bovendeerd², S. G. Oei¹
¹Máxima Medical Center, Veldhoven, Veldhoven, NETHERLANDS, ²Eindhoven University of Technology, Eindhoven, NETHERLANDS

#126—Runner Up

Evaluation of Respiratory Mechanics on the METI ECS, METI HPS, and Laerdal SimMan Full-Scale Simulator Mannequins

D. Liu¹, D. Campher², L. Brewer¹, S. A. Jenkins³
¹University of Utah, Salt Lake City, UT, ²Queensland Health Skills Development Centre, Brisbane, AUSTRALIA, ³Royal Adelaide Hospital, Adelaide, AUSTRALIA

Appendix 8: Abstracts as Printed in the *Simulation in Healthcare* Journal, Winter, 2009 Edition and in the conference Program.

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Education, competency, and assessment

A Pilot Project for an Advanced Clinical Skills Elective for School of Medicine Students

M. Ainsworth, R. Levy, R. Porter, B. Karnath, K. Szauter;
UTMB, Galveston, TX.

INTRODUCTION: Deficiencies in the clinical skills of senior medical students have raised concerns and prompted discussions among educators at the national level. It is widely recognized that clinical teachers often have little time to demonstrate, observe and provide feedback to learners. We developed a senior medical student elective to allow students to practice and receive individualized feedback on a wide range of clinical skills.

METHODS: The elective was offered to fourth year medical students in the spring of 2008. The registration was capped at four students to provide optimal practice and observation opportunities over a four week period. Five instructors (the authors) interacted with the students in teaching sessions employing genuine patients, standardized patients, task trainers, and high fidelity mannequins (Table). Students practiced basic and advanced patient skills (e.g: medical interview, physical examination, medical documentation, communication challenges, pelvic, rectal and breast examinations), identification of physical findings (e.g: eye, ear, heart, lung abnormalities), procedural skills (e.g: placement of intravenous lines, central venous catheters, nasogastric tubes), and advanced mannequin-based scenarios (e.g: ACLS, critical care diagnosis and management). Feedback was obtained immediately after each exercise, and a comprehensive feedback form was provided at the end of the rotation.

RESULTS: The students actively participated in all sessions, and feedback was overwhelmingly positive with respect to topic choices, relevance of the skills, and educational methods employed. For one skill, EKG interpretation, a pretest-posttest design was used to assess potential skill change; students demonstrated improvement ranging from 20–68% (confidence) and 12–36% (competence). The direct cost for the rotation was \$4544.

DISCUSSION/CONCLUSIONS: This pilot project had a second iteration planned for October 2008, which was cancelled due to Hurricane Ike. Portions of the curriculum from this elective are being adapted for existing courses, and the teaching techniques developed may also prove useful for remediation of student skills.

M. Ainsworth, None.

Expert Modeling Improves the Retention of Behavioral Skills in Simulation-based Neonatal Resuscitation Training

D. T. Leonard¹, H. Hackman¹, G. DeSandre², K. B. Boyle³, K. Leaning¹, J. LeFlore⁴, **J. M. Anderson¹**;

¹Oregon Health & Science University, Portland, OR, ²Santa Clara Valley Medical Center, San Jose,

CA, ³Stanford University, Stanford, CA, ⁴University of Texas at Arlington, Arlington, TX.

INTRODUCTION: The Neonatal Resuscitation Program (NRP) was developed in 1987 to increase success in neonatal resuscitation during the first few critical minutes after birth. Despite the positive impact on neonatal outcome, many of the skills acquired in the traditional NRP training (lecture-based) do not translate well to actual delivery room practice. Root cause analyses of term infant death and disability have identified a lack of expertise in requisite behavioral skills contributing to poor outcome. Where traditional NRP training involves a multiple choice examination with passive learning activities, experiential learning theory supports the use of simulation-based training to address the needs of adult learners in resuscitation training and focus on the principles of Crew Resource Management (CRM). NRPhas embraced these findings; all NRP training will be simulation-based by 2011. Improving this critical education will involve more than simulating a few resuscitations though; the ideal training paradigm will decrease the amount of real-life experience required to become an expert. Exploring expertise may allow refinement of our educational strategies in resuscitation training. In simulation-based training, learners learn from mistakes (learner modeling) during the facilitated debriefing, which promotes reflection-on-action. While reflection-on-action can change future performance, learning to reflect-in-action may be of equal importance. Reflection-in-action separates the novice from the expert, allows the participant to respond to cues in the environment and make critical decisions based on those cues. Demonstrating expertise involves modeling the expert's behavioral skills and revealing the internal conversation and critical thinking as the expert responds in the moment to these dynamic cues. When skills such as these are modeled, learners selectively take in information about performing; from these observations a mental image is created that provides a standard of reference for future performance. Previously we reported an improvement in behavioral skill acquisition when novices underwent expert modeling compared to learner modeling. Weretested these subjects 6 months after initial training to investigate how expert modeling impacts retention of behavioral skills.

METHODS: 31 subjects underwent simulation-based neonatal resuscitation training; they were then randomized by a table of random numbers to control group (learner modeling) or experimental group (expert modeling). Six months later they returned for testing. Demographic information, including information on whether they had rotated through the NICU, how many deliveries and how many neonatal resuscitations they attended and a subjective measure of confidence were collected. Participants individually led a simulated resuscitation of an apparently stillborn baby with a confederate team of a neonatal nurse and a respiratory therapist. These simulations were videotaped; blinded reviewers then scored the videos with a validated CRM-based behavioral assessment tool (BAT). Mean scores were calculated and compared for each group using a two tailed t-test.

RESULTS: There was no significant difference between the groups in age, gender, simulation experience, NICU experience, delivery room experience, resuscitation experience, or confidence. The experimental group (expert modeling) scored significantly

higher in behavioral skills than the control group ($p_{.001}$).

DISCUSSION/CONCLUSIONS: The addition of expert modeling to simulationbased neonatal resuscitation training improves the retention of CRM-based behavioral skills.

J.M. Anderson, None.

003

Education, competency, and assessment

Using a Virtual World Simulation as an Instructional Method to Teach Medical Trainees how to Perform Home Safety

Assessments

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INTRODUCTION: Teaching medical students to perform home safety assessment helps students recognize unsafe conditions in the home for patients with dementia and falls; however, conducting this activity in patient homes is resource intensive. Virtual worlds offer, tridimensional (3D), safe, usable, cost-effective, modifiable learning environments that can be manipulated to train learners. This study sought to address the following:

1. Does a simulated home safety assessment improve self-confidence?
2. Does performance in home safety assessments correspond to higher spatial ability?
3. Are there gender differences in performance and spatial ability?
4. Can a virtual world offer a viable instructional alternative to real life home safety assessments?

METHODS: Using a 3D virtual home, we conducted a pilot correlation study to evaluate the relationship between performance of a home safety assessment, spatial ability, and confidence with special reference to gender differences (IRB not applicable). Ten medical students, ten PGY1 internal medicine residents and ten geriatric fellows participated in this study. An expert panel of home care physicians generated an inventory of potential safety hazards and created a 60-item inventory checklist (Cronbach's alpha of 0.86). These hazards were replicated in a virtual house in the computer-based 3D virtual world Second Life (Linden Labs). Investigators instructed participants to identify as many hazards as possible in 20 minutes using a think-aloud protocol. The participants then completed a usability survey followed by the NASA TLX cognitive load scale, the mental rotation test (visual spatial ability) and Witmer presence questionnaire (sense of being in the virtual environment).

RESULTS: The mean age of participants was 29 yrs₃ (13 men and 17 women). The subjects mean score \pm SD on performance was 66%₁₅ on the inventory based questionnaire. Confidence in identifying home safety hazards improved significantly from a pretest median of 4₁ to a posttest of 6₁ on a 7 point Likert scale ($p_{.05}$). Spearman rho of posttest confidence scale did not show a significant correlation with performance, Spearman r (corrected) \pm 0.148 ($p_{.79}$). There were no significant differences in performance among participants based on level of training. Performance was highly correlated to visual spatial ability $r_{.7}$ $p_{.05}$. Presence was also correlated with performance $r(n_{30})_{.41}$ $p_{.05}$. Cognitive load was not associated with performance. Men scored significantly higher than women did on the mental rotation test ($p_{.02}$ with effect size, Cohen's $d_{.8}$). Men also performed better in identifying safety hazards than women ($p_{.04}$ with effect size, Cohen's $d_{.7}$). All participants reported that their experience had been positive. The majority of participants reported the environment as user friendly, entertaining and found the material helpful.

CONCLUSION: A virtual world offers a cost-effective alternative to a real world home safety evaluation by medical trainees. 3D virtual simulation improved self-confidence, was rated high in usability and represented a potentially valuable method for teaching and assessing performance. Educators need to be aware of differences in visual spatial ability by gender when implementing virtual world simulations since performance may favor men.

A.D. Andrade, None.

004

Education, competency, and assessment

Simulation-Based Mock Codes Improve Pediatric Patient

Survival Rates

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Simulation-based mock codes improve pediatric patient survival rates

Pamela Andreatta EdD, Ernest Saxton, BSN, Maureen Thompson, MSN, and Gail Annich MD

Category: 2

INTRODUCTION: A resident's leadership ability is integral to accurate and efficient clinical response in the successful management of CPA. Direct experience is a contributing factor to a resident's code team leadership ability, however opportunities to gain experience are limited by relative infrequency of pediatric arrests and code occurrences when residents are on service. The purpose of this study was to evaluate the viability and effectiveness of a simulation-based pediatric mock code program on patient outcomes, as well as residents' confidence in performing resuscitations.

METHODS: Clinicians responsible for pediatric resuscitations responded to mock codes randomly called at increasing rates over a 48 month period, just as they would an actual CPA event. Events were recorded and used for immediate debriefing facilitated by clinical faculty to provide residents feedback about their performances. Self-assessment data were collected from all team members. Hospital records for pediatric CPA survival rates were examined for the study duration.

RESULTS: Survival rates increased to approximately 50% ($p_{.000}$), correlating with the increased number of mock codes ($r_{.0.87}$). These results are above the average national rate of 27% and held steady for three consecutive years (2006 –2008) demonstrating the stability of the program's outcomes. The program significantly effected residents' confidence in performing resuscitations ($\eta^2_{.40}$, $p_{.001}$)

CONCLUSIONS: This study suggests that a simulation-based mock code program can significantly benefit pediatric patient CPA outcomes - *applied clinical outcomes* - not simply learner perceived value, increased confidence, or simulation-based outcomes.

The use of mock codes as an integral part of residency programs could provide residents with the resuscitation training they require to become proficient in their practice.

Future programs that incorporate transport scenarios, ambulatory care, and other outpatient settings could further benefit pediatric patients in pre-hospital contexts.

Pediatric Survival Rates Related to the Number of Mock Codes

P.B. Andreatta, None.

005

Education, competency, and assessment

Simulation-Based Training Improves Applied Clinical Placement of PICC Lines for Junior Radiology Residents

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University of Michigan, Ann Arbor, MI. Simulation-based training improves applied clinical

placement of PICC lines for junior Radiology residents. Pamela Andreatta, PhD1, Kyung Cho, PA2,

Yifang Chen, MD2 and Michael Marsh, MHA1 Category: 2

INTRODUCTION: Skilled placement of peripheral intravenous central catheters (PICC) has a profound impact on patient wellbeing and costs of care. There is some evidence that simulation-based training may support the acquisition of cannulation skills, and more concrete evidence that it increases learner self-efficacy in performing central venous catheterization. However, at present, there is no evidence to support the use of simulation-based training for the acquisition of Ultrasound-guided PICC skills. The purpose of this study was to evaluate the use of a simulation-based Ultrasound-guided PICC curriculum, and assess the transferability of PICC knowledge and skills to the applied clinical context of patient care. We asked two research questions: (1) Is there a significant difference between the performances of residents who train using simulation and residents who train through conventional residency training in the placement of PICC lines? (2) To what degree does simulation-based training impact learner self-efficacy in performing PICC cannulation?

METHODS: A sample of 32 PGY1 and PGY2 Radiology residents were randomly assigned to one of two conditions for learning to place an ultrasound-guided peripheral intravenous central catheter (PICC): Simulation-based training with required practice time (1-hour minimum) or clinically-based training in accordance with their prescribed residency rotations. All residents were trained using the 1-hand method and Seldinger technique for cannulation. Upon completion of their respective training, we assessed all residents performing PICC vascular access in a patient in an applied clinical context (Interventional Radiology). A faculty assessor who was blinded to the training assignment of the residents rated their clinical performance on eight skill-based PICC tasks. Independent *t*-tests were calculated to determine between group differences on each rated skill ($p \leq 0.05$).

RESULTS: The simulation-trained group performed significantly better on all rated performance parameters except threading the guide wire through the needle (already introduced in the vein) and into the lumen of the vein. All participants from the simulation-trained group were able to establish PICC access, whereas four residents from the non-simulation group (25%) were not able to place the PICC after the maximum allowable 3 attempts. Those residents who participated in the simulation-based training reported a significant difference in their abilities to help place a PICC $t(15) = 3.045$; $p = 0.010$, and to independently place a PICC $t(15) = 4.879$; $p = 0.000$.

CONCLUSIONS: We applied simulation to train residents in the practice of ultrasound-guided peripheral intravenous cannulation and found evidence that simulation-acquired PICC skills transfers to applied clinical practice, and that transfer appears to be more robust than that achieved through conventional rotation-based residency training. The use of simulation to support the acquisition of vascular access devices is merited for the benefits to patient wellbeing, clinician performance and costs-of-care.

P.B. Andreatta, None.

006

Education, competency, and assessment

A Healthcare Team Typology for the Development of Training and Competency Assessment

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INTRODUCTION: Effective interdisciplinary healthcare teamwork improves clinical and financial outcomes, and training and assessment of team competencies are central to establishing high-functioning healthcare teams. The roles that team members assume in the provision of patient care are important contributors to effective healthcare team performance, however the professional preparation of healthcare practitioners can lead to philosophical, political, social and clinical differences in perceptions and recommendations for patient care, as well as expected communication patterns and protocols. The purpose of this study was to describe the characteristics of healthcare team membership and associated role-behaviors in the provision of patient care across multiple clinical practice areas.

METHODS: Interdisciplinary healthcare teams were observed *in vivo* during the routine course of their work in multiple patient-care contexts. Data were collected and analysed using qualitative methods of observation and categorization, with supplemental interviews to substantiate, clarify and verify observations. The constant comparative method of data analyses was used to derive a compositional typology for healthcare teams.

RESULTS: A compositional typology for healthcare teams emerged from the data specifying four types of healthcare teams: Stable Role, Stable Personnel (Type SRSP), Stable Role, Variable Personnel (Type SRVP), Variable Role, Stable Personnel (Type VRSP) and Variable Role, Variable Personnel (Type VRVP).

CONCLUSIONS: Results suggest that healthcare teams may be more complicated than non-healthcare teams, and team models and associated derived competencies from other professions may not wholly transfer to healthcare. A singular model for training and assessment to optimize healthcare team performance may not adequately inform the specific performance challenges of each team type. Optimal healthcare team performance may require adaptable training strategies for each type of team and its associated role membership. The Healthcare Team Typology derived from this study may help inform the selection of appropriate team training and assessment of associated team competencies.

Healthcare Team Typology

P.B. Andreatta, None.

007

Education, competency, and assessment

Utilization of TeamSTEPPS and Full-Scale Simulation to Improve Pediatric Emergency Response Teams Knowledge and Performance

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INTRODUCTION: Responding to a pediatric emergency resuscitation situation is a critical event that requires high team performance to achieve the best outcomes for the pediatric patient. The purpose of the research study was to evaluate the effectiveness of a full-scale simulation course designed to enhance pediatric multidisciplinary resuscitation teams knowledge and application of TeamSTEPPS principles.

METHODS: 83 learners (11 teams) participated in a 4-hour course that included a didactic component using concepts from TeamSTEPPS and full-scale simulation. Eleven sessions were offered over an 11-month time period. Each session had a team comprised of a pediatric resident, a pediatric transport nurse, 2 pediatric critical care nurses, two pediatric general care nurses, a respiratory therapist, and a pharmacist. Each team participated in 3 full-scale simulation scenarios and 3 debrief sessions. Participants completed a pretraining questionnaire of existing teamwork in their practice, pre and post knowledge tests, the Mayo High Performance Teamwork Scale (MHPTS) after scenarios 1 and 3, and a course evaluation. All simulations were video recorded. An observer was blinded to the scenarios order and rated the teams using the MHPTS.

RESULTS: There was a significant difference in learner knowledge test from pretest to posttest (68_12 vs. 74_12, $p_{0.001}$). We found learner's self reported MHPTS (item 1–9) greatly improved (11_3 vs. 15_2, $p_{0.01}$). But learner performance rated by blinded rater did not show improvement on MHPTS item 1–9 (10_4 vs. 10_5, $p_{0.9}$)

DISCUSSION/CONCLUSIONS: A full-scale simulation course is an effective method for teaching TeamSTEPPS principles and improving Pediatric Emergency Response's perception of their teamwork performance.

REFERENCES (Optional):
J. Arnold, None.

008

Education, competency, and assessment

Pediatric Emergency Response Team Training using Simulation

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INTRODUCTION: Full-scale simulation education is a methodology that allows multidisciplinary team training in a safe environment. **Hypothesis:** Recreating pediatric medical emergencies using high fidelity mannequins can be used to enhance team training and practice skills. Our research questions addressed the following areas: reality of the scenarios compared to live cases, improvement in self-confidence during a pediatric emergency, and the utility of this approach to improve patient safety.

METHOD: A pediatric specific multidisciplinary training program was developed to enhance team performance and to provide an opportunity to practice emergency resuscitation skills. During the debriefing session, the team members had the opportunity to reflect on their performance. The multidisciplinary team involved five pediatric general care and intensive care unit Registered Nurses, a pediatric pharmacist, a senior pediatric resident, and a respiratory therapist. A total of 11 training sessions in a period of 11 months were completed. Eighty-three participants were involved and 81 completed a post-training questionnaire with specific questions covering the areas of interest. Two open questions were also included addressing expectations and recommendation of this training program to colleagues at work. Anonymity was maintained using individualized responses.

RESULTS: From all the responses, 67% strongly agreed this educational approach provides a realistic environment during simulation, 80% strongly agreed this training approach increased their confidence in attending future code situations with pediatric patients, and 89% strongly agreed that patient safety can improve with this training. The importance of understanding team roles and communication between team members were the most common identified learning experiences strengthening their personal practice at the end of the session. Qualitative data indicated 79% of the learners found this training to meet their expectations and would recommend it to their colleagues at

work.

CONCLUSION: The use of a multidisciplinary simulation education approach was considered by this adult learner group as an excellent method to improve patient safety. It also provided an increase in self-confidence during emergency situations for most participants. Our results also suggest that although high fidelity mannequins can provide enough physiological data, the full recreation of a scenario lacks some elements to satisfy a real pediatric emergency code. Altogether, these data provide the learners' perspective in the use of simulation for teaching and debriefing the low volume, high risk pediatric medical emergencies. As more investigation address this particular area, better and more efficient educational programs can be developed.

G.M. Arteaga, None.

009

Education, competency, and assessment

Outcomes of a Simulation-Based Pediatric Crisis Resource Management Workshop for Emergency Medicine Residents

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INTRODUCTION: Crisis Resource Management (CRM) is the management of complex and dynamic situations requiring high cognitive demand and teamwork [1]. It is a component of innovative curriculums in anesthesia, intensive care, and emergency medicine. The aim of CRM training is to improve the “human errors” by emphasizing training in effective teamwork and systematic responses to medical crisis [2].

Emergency medicine trainees feel well trained for the management of the adult patient in acute and non-acute situations; however, their exposure to pediatrics is quite limited. 75.6% of practicing EM physicians were completely comfortable in managing adult cardiopulmonary arrest while only 24.4% were completely comfortable with pediatric cardiopulmonary arrest [3]. Notably, children's access to emergency care is good but their ability to access ‘specialized’ pediatric care is limited, thus most children are cared for by general emergency physicians [4]. Improved training of pediatric resuscitation is clearly needed in Emergency Medicine (EM) residencies.

METHODS: We created a workshop for EM residents to learn team dynamics and management of specific pediatric pathologies that differ from those of adults. We conducted a needs assessment of EM trainees and faculty who supervise them. Specific objectives were identified and subsequently utilized in the creation of the workshop stations. Our aim was to provide a realistic learning experience for residents to address deficiencies in their clinical training.

The workshop included, a mini plenary, 5 simulation scenarios with debriefing (2 high fidelity and 3 low fidelity) and a group debrief of the workshop. Analysis of an anonymously completed end of workshop survey demonstrated that there were significant perceived improvements in the resident's subjective ability to break bad news, lead a team effectively, recognize their limitations and ensure closed loop communication [5]. The current abstract explores resident's subjective ability to explain a medical condition to a parent, manage a critically ill neonate and listen to team members suggestions using a post-workshop survey (with a retrospective pre-component to assess perceived change). We also assessed whether the workshop was perceived as a valuable educational tool, which should be part of the EM core curriculum.

RESULTS: 15/16 eligible EM residents (PGY1–5) attended the workshop and completed the surveys. 14/15 believed the workshop should be a mandatory component of EM training and all said they would recommend it to future colleagues. Overall rating

on the 'value' of the workshop was 5.33 on a 6-point Likert scale (1_strongly disagree, 6 _ strongly agree). There were significant differences in retrospective-pre to post medians (6-point scale) on the following items (Wilcoxon rank-sum for non-parametric measures): ability to explain a medical condition to a parent (4 vs. 4, p_0.014); ability to manage an ill neonate or infant (4 vs. 4, p_0.009); and ability to listen to team members suggestions (5 vs. 5, p_0.011).

CONCLUSION: Learners believed that attending the workshop improved their ability to lead a pediatric resuscitation, communicate effectively with parents, manage ill neonates, comply with CRM principles, and that it was a valuable learning experience that should be mandatory in their core curriculum.

I. Bank, None.

010

Education, competency, and assessment

Simulation-based Training to Teach Paramedics how to Place and Intubate Through the Single-use LMA-Fastrach™

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INTRODUCTION: Local paramedics are following a new protocol utilizing the single-use LMA-Fastrach™ (*i*LMA) as the primary airway rescue device. The departments of Anesthesiology and Emergency Medicine (EM) at the University of Wisconsin separately developed and administered simulation-based educational interventions instructing paramedics in placement of an *i*LMA and passage of a tracheal tube through it. Study objectives included (1) evaluation of training, (2) determining any difference between anesthesia and EM-based training, and (3) determining whether prior experience or gender affected success rates.

METHODS: Paramedics attempted to place a #3 single-use *i*LMA into an Airsim™ airway management trainer. Blind insertion of a tracheal tube through the *i*LMA was then attempted. Consistent with paramedic protocol, removal of the *i*LMA over the tracheal tube was not attempted.

The time required for *i*LMA insertion (T1), for tracheal intubation through the *i*LMA (T2), and the total time from picking up the *i*LMA to confirmed tracheal intubation (T3) was recorded. Prior to attempted intubation, the view of the vocal cords through the *i*LMA was graded using a fiberoptic endoscope as: 1_full view, 2_partial view of the cords, 3_epiglottis only, or 4_other (LMA, cuff, pharynx, other).

Age, gender, years of paramedic experience, previous healthcare licensure, and type of *i*LMA training were included in the analysis. Paramedic experience was defined as _3 years, 4–14 years, _15 years. Type of *i*LMA training was as either anesthesia, EM-based, or both. Group comparisons were made by Mann-Whitney U or one-way ANOVA with significance defined by a two-tailed p-value_0.05. Data is presented as mean_SD and number and percentage.

RESULTS:

Demographics: 35 participants aged 39_11 years, 26 (74%) male and 9 (26%) female with 8.8_5.6 years of prior paramedic experience. All participants had previous experience as an EMT-basic 26(74%) or intermediate 9(26%) prior to becoming a paramedic 6.2_6.6.

Training: 30 (86%) participants completed *i*LMA training and 5 (14%) did not. Of those participants who underwent training, 16 received anesthesia-based, 8 received EM-based training, and 5 had completed both training interventions.

Task completion: 33 (94%) *i*LMA insertions were successful on the first attempt. Two

(6%). insertions required a second attempt. Insertion took 38_14 seconds. Thirtythree (94%) of the participants successfully intubated through the iLMA on first attempt, one (2%) on the second, and one (2%) on the third. Intubation time was 33_7.8 seconds. The total time to complete iLMA and endotracheal tube placement was 72_17 seconds. No differences were found between gender, among years of experience, or among type of training.

DISCUSSION: Our study indicates that paramedics can be taught to insert and intubate effectively through an iLMA using an airway management simulator regardless of gender or years of prior experience. The clinical discipline of those providing instruction did not affect paramedics' ability to correctly use an iLMA. This is consistent with the available research on novice use of laryngeal mask airways and supports the continued introduction of the LMA into the pre-hospital environment. Further research should include an examination of paramedics' success rates deploying the LMA in actual patients.

REFERENCES:

On request

E.B. Bauman, City of Middleton EMS, Employment, Salary; Town of Madison Fire Department, Employment, Consulting Fee; Vernon Memorial Healthcare, Speaking and Teaching, Consulting Fee; Pfizer, Employment, Ownership Interest/Stocks; Black-Rock Health Sciences Opportunities, Employment, Ownership Interest/Stocks.

011

Education, competency, and assessment

Simulation-based Evaluation of an Ergonomically Designed Face Mask among Novice Users

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INTRODUCTION: The ErgoMask™ is a new facemask designed to ergonomically fit the clinicians' right hand. The dome of the ErgoMask™ contains grooves and edges enabling the operator to use an asymmetrical left-hand grip, with the posterior part of the mask higher than the anterior. This design should better enable full contact between the operator's hand and the mask, avoid hand fatigue, allowing for better control of the facemask. We hypothesized that ventilation with the ErgoMask™ would result in greater delivered tidal breaths as compared to a standard facemask.

METHODS: Allied health students with minimal airway management training used a standard or ErgoMask™ to ventilate a Laerdal® Airway Management Trainer in a random, crossover design using their left hands. A Pulmonetics LTV®1200 volume-cycled ventilator set to deliver a tidal volume of 500 mL, 12 times per minute, at an inspiratory-to-expiratory ratio of 1:4 (cycle-length 5 seconds) provided the actual ventilation. Participants squeezed a breathing bag with their right hand in time with the ventilator-delivered breath to simulate actual bag-valve-mask (BVM) ventilation. After a brief tutorial on each mask, participants performed basic airway maneuvers on the airway trainer and obtained a mask seal prior to the first ventilator-delivered breath. The returned tidal volume was recorded for each of 12 breaths for each participant for each mask. Differences in minute ventilation between masks were assessed by paired student T-Test with a significance defined by a p-value of ≤ 0.05 . Any effect on the ability to ventilate over time with each mask was assessed by a mixed effect analysis of covariance (ANCOVA) with tidal volume set as the response variable and mask type,

number of breaths, and gender as covariates with significance defined as a p-value ≤ 0.05 .

RESULTS: Nine paramedic (28%), 6 EMT (19%), and 17 RT (53%) students, aged 28_7 years participated. There were 12 (38%) males and 20 (62%) females. Minute ventilation was significantly greater with the ErgoMaskTM than the standard mask (4418_1261 vs. 3129_1693 mL, $p \leq 0.001$). Overall, by ANCOVA, tidal volumes were significantly higher at all time points using the ErgoMaskTM compared to the standard mask. Over time, ventilation via the ErgoMaskTM did not significantly decrease (0.13 mL/breath) whereas use of the standard mask resulted in a linear decrease in ventilation by 10 mL/breath ($p \leq 0.001$). This decay in ventilation over time was unaffected by gender. However, males performed better than females at all time points regardless of mask type used.

CONCLUSIONS: Novice airway managers were able to more effectively ventilate via a facemask by using an ergonomically designed device, the ErgoMaskTM, compared with a traditional standard mask. Further, performance did not decay over time when subjects were using the ErgoMaskTM, whereas significant decay did occur with the standard mask. Insofar as BVM is likely to be necessary for more than the 1-minute tested here in actual clinical resuscitation scenarios, using the ErgoMaskTM may have an even greater impact than what we have shown. Clinical correlation and further examination of gender differences is needed.

E.B. Bauman, City of Middleton EMS, Employment, Salary; Town of Madison Fire Department, Employment, Salary; Vernon Memorial Healthcare, Speaking and Teaching, Consulting Fee; Town of Madison Fire Department, Speaking and Teaching, Consulting Fee; Pfizer, Employment, Ownership Interest/Stocks; BlackRock Health Sciences Opportunities, Employment, Ownership Interest/Stocks.

012

Education, competency, and assessment

Resuscitating a Pregnant Patient: Use of Simulation to Compare Performance and Knowledge Among Maternal Fetal Medicine and Critical Care Medicine Fellows

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Critical Care Medicine, Beth Israel Medical Center, New York, NY.

INTRODUCTION: Our objective was to compare the performance of Critical Care Medicine (CCM) and Maternal Fetal Medicine (MFM) fellows in a simulated maternal cardiac arrest.

METHODS: A multidisciplinary CCM and MFM team designed a maternal cardiac arrest scenario. After an introduction to the simulator (NOELLE, Gaumard Scientific) and the simulated environment, CCM (7) and MFM (6) fellows were individually presented with an unresponsive, pulseless full term pregnant patient. A standardized checklist was used for scoring. Critical Care Total median, Pregnancy Specific Total median and Knowledge Total median scores were used to compare performance and knowledge between the groups. The number of fellows appropriately completing each

task was compared between the groups. Mann-Whitney, chi square, and Fisher's exact tests were used as appropriate.

RESULTS: In the Table below, we show the results for selected expected tasks observed. There were no significant differences in critical care or pregnancy specific median performance scores or knowledge scores between the MFM and CCM fellows. However, CCM fellows performed significantly better than MFM fellows in initiation of timely CPR. MFM fellows performed significantly better than CCM fellows in timely requesting help from the opposite team. [*p_0.05, Fisher's Exact Test]. Trends were observed for differences in other tested variables (e.g. first and subsequent drug used, request for defibrillation) but small numbers limited our ability to draw firm conclusions.

DISCUSSION/CONCLUSIONS: Both groups proved to have adequate knowledge but it did not translate into appropriate management of a simulated maternal resuscitation. This attests to the value of simulation training for such events. In addition, simulation allowed for the identification of common weaknesses and specialty-specific areas for improvement for MFM and CCM fellows. This information will allow us to target education and interventions with the ultimate goal of improving the management of these rare, catastrophic cases.

REFERENCES (Optional):

V. Bayya, None.

013

Education, competency, and assessment

The Use of a Three-tiered Rating Scale for the Evaluation of High-fidelity Simulation Resident Performance

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INTRODUCTION: There is no universal acceptance of an ideal performance assessment instrument for high-fidelity simulation (HFS) exercises. Assessment instruments generally consist of checklists with binary scoring or the use of global rating scales. Our study hypothesis was that an HFS assessment instrument consisting of an anchored three response choice for each item would result in acceptable levels of inter-rater reliability, and support the construct validity of a three scenario HFS exercise. This project was considered exempt by the Summa Health System IRB.

METHODS: Residents from a university-affiliated emergency medicine residency program participated. Each group of residents participated in three different chief complaint HFS exercises (chest pain, asthma, and seizure). Each scenario including assessment instrument and anchors was written and reviewed by senior faculty for content validity. Each chief complaint scenario was piloted with two non-participating senior residents. Each scenario used a nurse, medical student actor, and simulator technician. Each scenario was recorded and subsequently scored separately by two faculty members asynchronously. The two faculty member raters were trained in two different sessions, and included sample scoring of the pilot sessions. Each HFS session took place using the METI ECS simulator mannequin in a dedicated simulation room that mimicked an actual emergency department patient care room. Each item scored on the assessment instruments had three possible choices (needs improvement, meets expectations, above expectations), with each choice having well-defined descriptive anchors. Construct validity of the exercise was measured using comparison of scoring between PGY 1 and PGY3 levels. Analysis of performance between PGY levels was conducted by t test analysis of the raters' mean scores. Inter-rater reliability was measured using Cronbach's alpha and intraclass correlation coefficients (ICC), absolute.

RESULTS: The PGY 1 and 3 mean differences with 95% confidence levels for each scenario are .54 (.43, .65), .25 (.14, .37), and .30 (.17, .44) for chest pain, asthma, and seizure scenarios, respectively. Cronbach's alpha results for total scores were .67, .61, and .71 for chest pain, asthma, and seizure scenarios, respectively. ICC scores with 95% confidence intervals were .50 (.42, .56), .42 (.31, .51), and .52 (.39, .62) chest pain, asthma, and seizure scenarios, respectively. **DISCUSSION/**

CONCLUSIONS: The lack of a universally accepted ideal performance assessment instrument for HFS exercises prevents the establishment of validated standards for performance by residents. Binary checklists recognize either/or scoring responses, but may fail to recognize the timing of critical actions. Global rating scales offer a more subjective measure of HFS performance. Our anchored three possible choice item scoring attempted to recognize a greater degree of potential performance discrimination with each item, compared to a pure binary score. Additionally, by limiting the potential scoring to three responses, it was possible to write well-defined anchors for each, limiting the subjectivity that global rating systems can have. Our results demonstrated construct validity by improvement in scoring from PGY1 to PGY3 levels. Our three choice item scoring method for HFS resulted in moderate inter-rater reliability, and may provide a scoring technique with less subjectivity than a global rating scale.

REFERENCES (Optional):

M.S. Beeson, None.

014

Education, competency, and assessment

**Accuracy of Self Assessment for Crisis Resource Management
Before and After Video Review.**

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INTRODUCTION: Crisis management and non-technical skills are key skills to ensure patient safety in anesthesiology practice. The competent physician is a self-directed lifelong learner who can accurately recognize their own strengths and deficiencies. A meta-analysis in health professions yielded low correlation between self and expert assessment [1]. However, self-observation of videotaped performance has been found effective to improve the accuracy of self-assessment of technical skills. This study aimed to determine the accuracy of self-assessment of performance of non-technical skills before and after video review, when compared to expert assessment.

METHODS: After IRB approval and informed consent, 24 anesthesia residents reviewed the principles of non-technical skills for crisis management, prior to individually participating in a high-fidelity simulated anesthesia crisis scenario. Immediately after the scenario, each participant evaluated their own non-technical performance using the previously validated Anaesthetists' Non Technical Skills (ANTS) system, giving a score for each of the 4 categories of the scale (task management, situation awareness, team working, decision making) which were then summed for a total ANTS score. Participants then reviewed a video of their performance without an expert facilitator and re-evaluated their ANTS categories. Two blinded experts then rated the videos of the simulation sessions using the same scale. A Spearman's rho was performed to assess the correlation between self and experts for the total ANTS scores.

RESULTS: Expert inter-rater reliability was substantial (ICC_0.63). There was no correlation between expert assessment and self-assessment either before or after video review of their performance.

DISCUSSION: Self-assessment of non-technical skills following a simulated crisis did not correlate with an expert assessment of performance. Correlations did not improve with self-observation through video review without debriefing. Future research should address strategies to improve self-assessment of non-technical skills to enhance continuing professional development as it relates to crisis management.

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S. Boet, This study was supported by a grant from the Network of Excellence in Simulation for Clinical Teaching & Learning, Toronto, Canada, Other Activities, Other Financial Benefit.

015

Education, competency, and assessment

Should Continuous Simulation-Based Medical Education be Tailored to the Anesthesiologists' age?

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INTRODUCTION: As both technical and non-technical skills are crucial for patient safety in airway management, continuous medical education provides anesthesiologists with airway training. Current training is uniform and not tailored according to anesthesiologists' characteristics, assuming that the individual specific weaknesses can be erased by a standardized training. This study examined the effect of age on learning and performance of emergency percutaneous cricothyroidotomy in a high-fidelity simulated Cannot Intubate, Cannot Ventilate (CICV) scenario.

METHODS: After IRB approval and informed consent, 19 anesthesiologists aged 45yr participated in a simulated CICV scenario leading to end pathway of an emergency cricothyrotomy. All participants then individually received a standardized video-assisted expert debriefing focused on both non-technical skills and technical cricothyrotomy skills. Immediately after, they participated in a second simulated CICV scenario. Each performance was video-recorded. Later, two independent expert evaluators scored each performance using the validated Anaesthetists Non-Technical Skills (ANTS) scale, a task specific checklist, global rating scale and procedural time for cricothyrotomy.

RESULTS: All baseline, pre-standardization parameters were significantly better for

DISCUSSION/CONCLUSIONS: Baseline proficiency with simulated emergency cricothyroidotomy is associated with age. Despite standardized teaching on both technical and non-technical skills, operator age continues to adversely affect the performance of simulated emergency percutaneous cricothyroidotomies. Continuous simulation-based medical education may need to be tailored according to certain anesthesiologists' characteristics such as age to achieve desired proficiency in rarely performed emergency complex technical tasks.

S. Boet, None.

Intubation Training for Hospitalists and Selection of a Backup**Airway Device****A. P. Borzotta**, J. Ingham, R. Johann, P. Erpenbeck;

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INTRODUCTION: Safely securing an airway during emergencies is a high priority. Laryngoscopic intubation is not always successful, and difficult airway carts are not always available. We set out to review hospitalist intubation skills, demonstrate alternative airway devices and determine preferences among five devices for addition to 'code carts'.

METHODS: Airway anatomy and function was reviewed by watching a video. Laryngoscopy skills were defined, demonstrated and observed based on a 27-item checklist using task trainers. In a separate session, paramedic instructors individually trained hospitalists on five alternative airway devices. Physiologic mannequins replicated normal to compromised airways. Physicians assessed each device by ease of use (1, very easy to 5, very difficult) and then ranked each device by preference as a rescue or back-up airway, from first to fifth.

RESULTS: All 9 hospitalists were familiar with direct laryngoscopic intubation, and satisfactorily demonstrated basic skills. In addition, one had previously used a gum bougie, one a CombiTube and one a GlideScope. In all other instances, the session marked their first exposure to the five listed devices listed and instruction in their use. Most did not expect to personally require resort to a back-up method of intubation in their own practice.

Most hospitalists were comfortable with all devices (ease of use median scores of very easy to easy), favoring devices most like the standard laryngoscope. There was a decided preference for the King tube as a back-up method.

CONCLUSIONS Task trainers allowed hospitalists to practice not readily available in the operating room. For most, this was the first exposure to alternative airways. Using mannequins with variable airway difficulty allowed ranking of rescue devices. While small numbers are a statistical weakness, they represent choices by actual users. Our next step is to request that the appropriate device be routinely added to code carts.

A.P. Borzotta, None.**Table****DEVICE****Ease of Use Back-up Method****Mean Median Mean Median**

BVM 1 1 n/a n/a

Laryngoscope 1.5 1.5 n/a n/a

Gum Bougie 1.8 2 2.4 2

LMA 2 2 3.3 3.5

CombiTube 2.4 2 3.2 3

King Tube 2 2 2 1

AirTrak 1.75 1.5 2.8 3

Education, competency, and assessment

**Debriefing Assessment for Simulation in Healthcare (DASH):
Assessment of the Reliability of a Debriefing Instrument for
Use in the EXPRESS Study and Beyond**

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INTRODUCTION: Debriefing is a facilitated conversation following a critical event in which participants explore and analyze their actions and thought processes in order to improve future performance. A reliable and valid tool capable of assessing healthcare simulation debriefing is needed to enhance instructor training and document debriefing competency. The Debriefing Assessment for Simulation in Healthcare (DASH) is designed to meet this need. The DASH was developed in the context of a multicenter study assessing the impact of a debriefing script on the debriefing skills of novice Pediatric Advanced Life Support instructors (the EXPRESS study, Examining PALS Resuscitation using Simulation and Scripts). The DASH is a six element, evenly weighted, criterion-referenced, behaviorally anchored rating scale. Content validity is derived from theoretical foundations in organizational behavior, experiential learning, and related fields. Each element is scored on a 7-point Likert scale. Elements collectively assess the debriefer's ability to create an engaging and safe learning environment, foster reflective practice, and help identify and close observed performance gaps.

METHODS: Fifty multiprofessional simulation instructors from around the world participated in a live, web-based DASH training session. They viewed and scored a series of standardized poor, superior and average debriefings created by the DASH developers. Inter-rater reliability of the DASH was assessed from the raters' scores at the element level and for the 6 elements overall using intraclass correlation coefficients (ICC). Additional inter-rater reliability data were obtained from the scores of a separate group of seven raters from the EXPRESS study after a two-day training session.

RESULTS: The six elements of the DASH had the following correlations coefficients for the multiprofessional instructors: for element one, 'sets the stage for an engaging learning environment', the ICC was 0.75. For element 2, 'maintains an engaging context for learning', the ICC was 0.83. For element 3, 'structures debriefing in an organized way', the ICC was 0.83. For element 4, 'provokes interesting and engaging discussions and fosters reflective practice', the ICC was 0.84. For element 5, 'identified performance gaps', the ICC was 0.71. For element 6, 'helps close performance gaps', the ICC was 0.80. The overall ICC for the DASH was 0.77. For the EXPRESS raters, the ICCs ranged from 0.73 to 0.94, with the exception of element 1 which had an ICC of 0.44. Their overall ICC for the DASH was 0.81.

DISCUSSION/CONCLUSIONS: A debriefing evaluation tool both allows assessment of debriefing competence and provides debriefers with necessary feedback to improve their performance. Importantly, improved simulation-based debriefing is expected to lead to enhanced instructor feedback and debriefing skills in the clinical setting as well. Our data support the robust inter-rater reliability of the DASH as well as its generalizability to simulation instructors from many professions and locations. Ongoing analyses within the EXPRESS study will provide additional support for the validity of the DASH. Our ultimate goal is its dissemination for widespread use, to

provide support for educators in their use of debriefing as a critical educational modality, and to develop reflective healthcare practitioners.

M.B. Brett-Fleegler, None.

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Education, competency, and assessment

Evaluating the Face and Content Validity of a Low-Cost Genetic Amniocentesis Trainer

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INTRODUCTION: Learning the basic skills for performing genetic amniocentesis is difficult as no low-cost, appropriate fidelity models for training exist. Experience is generally obtained in a clinical setting with on-going pregnancies. This type of training is difficult to coordinate and perform with couples that are already extremely nervous and watching the entire procedure. In order to enhance training while providing improved opportunity for demonstrated proficiency, we developed and tested a low-cost model to practice genetic amniocentesis.

METHODS: A hands-on demonstration workshop for ultrasound guided needle procedures was given at the Annual Meeting for the Society of Maternal Fetal Medicine.

Participants engaged in eight clinical stations in performance of genetic amniocentesis, transabdominal and transcervical chorionic villus sampling, and in-utero stent placement. Participants filled out a pre- and post- workshop questionnaire evaluating demographics, experience, and model evaluation.

RESULTS: Following the personal use of the genetic amniocentesis model, 100% (23/23) of attending physicians and 100% (7/7) MFM fellows described appropriate realism when viewed sonographically. 91% (21/23) of attending physicians and 100% (7/7) of MFM fellows described appropriate tissue resistance during the procedure. One hundred percent of attendees agreed that these models could be used to teach proper technique to fellows and staff. Eighty-three percent (19/23) of attending physicians and 100% (7/7) of MFM fellows responded that they would personally make these models would enhance current methods of genetic amniocentesis training. Seventy-seven percent (17/22) of attending physicians and 86% (6/7) of MFM fellows responded that they would purchase such a model if commercially available.

DISCUSSION/CONCLUSIONS: Our genetic amniocentesis trainer appears to have good face and content validity. These tools will be a valuable educational adjunct to facilitate training in these ultrasound guided needle procedures.

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B.C. Brost, None.

A Multirater Tool for the Assessment of Participant Knowledge and Skills During Simulated Pediatric Crises

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INTRODUCTION: Simulation is a powerful tool for the teaching of pediatric crisis resource management (CRM) skills. At present, few validated assessment tools exist that are designed to measure pediatric CRM skills in the simulated environment. Multirater assessment with Gap Analysis is a robust methodology that enables the measurement of self-appraisal as well as competency, offering course faculty the ability to provide feedback that enhances reflective practice among participants. The Resident Performance During Simulated Crises (RPDSC) instrument was designed with the intent of applying multirater methodology and gap analysis to the simulated environment. Our goal was to develop a psychometrically robust assessment tool for the assessment of team ability and team self-appraisal during simulation-based pediatric CRM sessions.

METHODS: This study was exempted from review by the University of Louisville Institutional Review Board. The RPDSC was developed based on the Accreditation Council for Graduate Medical Education core competencies. It contains five domains, each consisting of a series of descriptive rubrics used to rank the specific associated domain. The tool was piloted during a series of simulated Pediatric CRM sessions. Each session was one hour in length, and consisted of a standardized introduction to CRM principles followed by a simulated patient encounter and debriefing. Assessments of the participant group's performance were completed by all faculty members present using the RPDSC. A self-assessment was also completed by each team. Cronbach's Alpha and Intra-class Correlations (ICC) were used to examine instrument reliability. Gap analysis results were presented descriptively.

RESULTS: 57 simulated pediatric CRM sessions were assessed. Average cronbach's alpha for the tool was 0.70. Overall ICC for the tool was 0.83. ICC values for the medical knowledge, clinical skills, communication skills, and systems-based practice domains were between 0.87– 0.71. ICC for the professionalism domain was 0.25. Further examination of the professionalism domain revealed a tendency toward higher scores. 51 (89%) of simulated sessions had one or more significant gaps. 43 (75%) of sessions had gaps indicating self-over appraisal, and 10 (18%) of sessions had gaps indicating selfunder appraisal.

CONCLUSIONS: The RPDSC is an internally consistent and psychometrically valid tool for the assessment of overall competence and for the assessment of medical knowledge, clinical skills, communication skills, and systems-based practice in the context of a simulated pediatric CRM session. Gap analysis reveals frequent disparities between faculty and self-assessment, indicating areas where enhanced participant self-reflection may be needed. Identifying self-under appraisal, particularly in areas needing improvement, can facilitate focused educational intervention. Professionalism remains difficult to assess, with a significant halo effect apparent in the data. This issue will be addressed in further iterations of the RPDSC.

A.W. Calhoun, None.

Comparing Learning Outcomes - Simulation versus Traditional Methods in a Nursing Curriculum

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INTRODUCTION: Nursing research provides inconsistent results when attempting to measure the effect of simulation on students integration of psychomotor, critical thinking, clinical judgment, communication skills, and self-efficacy. In addition, a recent review of the literature (Kaakinen & Arwood, 2009) found that 94 out of 120 simulation manuscripts described simulation as a teaching method rather than a cognitive task. This study examines the integration of simulation scenarios into the nursing curriculum as part of class and compares a cohort of students receiving traditional education with a cohort that received simulation scenarios as a teaching-learning method in the same class. The conceptual framework for the study was the “Framework for Simulation Learning in Nursing Education” (Daley & Campbell, 2009). The research question was: “Do simulations used as an integrated component in the nursing curriculum enhance students’ clinical competence, learning, and self-efficacy, when compared to traditional educational methods of the same content?”

METHODS: A cohort of students in a BSN program received one of two educational methods for their women’s health course. The control group (N=19) received the traditional method of education in Spring 2008, the experimental group (N=34) received the traditional method plus eight simulation scenarios integrated into classes. The simulation scenarios were run during class time while the rest of the class observed them live via video, debriefing was done with the entire group. Measurements to compare group differences in learning included: knowledge transfer as measured by final exam grades, final course grades and ATI OB Test results; clinical competence as measured by clinical evaluation tools; and self-efficacy as measured by the authors’ instrument.

RESULTS: T-tests of group means on the Final Exam and final course grades demonstrated significant differences, respectively ($t_{2.07, df_{51}, a' p_{.025}}$), ($t_{3.77, df_{51}, a' p_{.0005}}$). ATI test scores were difficult to interpret. Self-efficacy was enhanced in both groups from pre- to post-measurements, but there was not a statistically significant difference between groups. Finally, the generality of the clinical evaluation tools did not allow for a distinct differentiation between groups on clinical parameters.

DISCUSSION/

CONCLUSIONS: A shift in the educational paradigm toward competency-based training such as the use of simulation, requires continued research of the effect of simulation-based pedagogy on knowledge transfer and clinical performance. Examining learning outcomes is an important step to verifying the usefulness of this method. This study provides support for the integration of simulation into the nursing curriculum as part of the class content to enhance student learning and knowledge transfer. More research is needed to distinguish the effect on clinical competence and self-efficacy.

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Scholarship, 6, 1.
S. Campbell, None.

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Education, competency, and assessment

Using Microsimulation to Enhance Student Nurses' Clinical Skills

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INTRODUCTION: Globally, nursing education programs struggle to prepare graduates who are 'fit for practice'. Too often graduates have difficulty interpreting and using information about changes in patients' conditions. They are slow and tentative. This study used Miller's paradigm to examine differences in undergraduate nursing students' performances (accuracy and timeliness of care) associated with the way in which initial instruction was provided on concepts and principles of airway management: lecture or microsimulation.

METHODS: The study used a randomized control group design in which students in a required pediatric nursing course were randomly assigned for initial learning of concepts and principles of airway management to either the traditional lecture mode of instruction (pre-assigned readings, lecture, lecture notes) or microsimulation (Laerdal's MicroSim In-Hospital; acute asthma). Knowledge acquisition was assessed using multiple choice exams at 3 weeks and 2 months after instruction. All students participated in a pediatric respiratory distress scenario (using SimBaby) and completed a severe asthma microsimulation. About 5 months after initial learning, students completed an OSCE using a SimBaby scenario of a 5 month old male brought to emergency services for cough with audible wheeze. Performance was videotaped. A rater blinded to instructional mode viewed each videotape, used a checklist to identify care steps performed and their sequence, and used a stopwatch to capture timeliness of care. The study had institutional review board approval.

RESULTS: Knowledge acquisition data were available on 76 students (38 in each group). Analyses of variance revealed that the two groups were similar in age, gender, ethnic mix, and grade point average and did not differ in their performance on the multiple choice exam items. There were no statistically significant differences in students' scores on the severe asthma microsimulation when first attempt scores served as the outcome measure. Students who learned via lecture were more likely than were those who learned via microsimulation to repeat the severe asthma microsimulation and, as a group, engaged in microsimulation significantly longer than did students who learned via microsimulation. OSCE data were available on 40 students (18 in the lecture group and 22 in the microsimulation group); the two groups did not differ in age, gender, ethnic mix, or pediatric course grade. Significantly more students who learned via microsimulation assessed respiratory rate, assessed oxygen saturation, and noted cyanosis. About half of the students in each group performed the care steps in the correct sequence (53% of those who learned via microsimulation and 47% of those learning via lecture). There were no differences in the timeliness of care associated with mode of learning. Although not statistically significant, students who learned via lecture more often than those who learned via microsimulation provided care that led to deterioration of patient condition.

DISCUSSION/CONCLUSIONS: Students learning concepts and principles of airway management via microsimulation outperformed those who learned via lecture.

The results suggest that systematic implementation of microsimulation for other care concepts should be evaluated as microsimulation may help graduates improve their readiness for practice.

REFERENCES (Optional):

1. **C.L. Cason**, The study was funded by Laerdal Medical Corporation, Stavanger, Norway., Independent Contractor, Other Financial Benefit; Laerdal Medical Corporation, Independent Contractor, Other Financial Benefit.

022

Education, competency, and assessment

Inter-rater Reliability of Competency-specific vs. Generalized Checklists for the Evaluation of Resident Performance in Simulated Critical Events

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BACKGROUND: Developing an optimal scoring system for resident performance in simulated events is an ongoing challenge. In this study we compared the inter-rater reliability of a competency- specific checklist to a generalized checklist. Specific checklists evaluate unique actions for managing a given event; however, developing and validating new checklists for every relevant competency is cumbersome. Utilizing a single generalized checklist might provide a solution to this problem.

METHODS: In this IRB approved study, data from eleven novice anesthesia residents were analyzed. Residents participated in a structured simulation-based training curriculum in critical intra-operative events. We rated residents' performance in one scenario at the 3-week testing session. Three reviewers used a competency- specific checklist, and three reviewers used a generalized checklist. Both the specific and the general checklists have been validated using a modified Delphi technique. We initially developed the general checklist as a universal template based on the following four categories: Initial response, Discovering etiology, Management, and Secondary survey, including calling for help. The competency-specific checklists tailored the first three categories to delineate unique behaviors for each competency. The items in the secondary survey category were identical for both checklists.

RESULTS: Data from a single scenario of intra-operative bronchospasm were analyzed. Inter-rater reliability for the raters' scores was determined using Pearson correlations (Table 1). Overall rater correlations were stronger for the specific checklist compared to the generalized checklist. When analyzed by category, there were significant inter-rater correlations in all four categories for the specific checklist, and in three categories for the general checklist.

CONCLUSIONS: Our results show that a competency- specific checklist yielded higher inter-rater reliability compared to a generalized checklist strategy. Although use of a generalized checklist is feasible, it may be prudent to maintain a competency-specific approach for evaluating resident performance in simulated critical events.

L.A. Chalifoux, None.

Table 1 Inter-rater Reliability

Rater Comparison

Specific

Checklist R_

Generalized

Checklist R

- 1 vs. 2 0.801 (P_0.003)
- 1 vs. 3 0.872 (P_0)
- 2 vs. 3 0.718 (P_0.013)
- 4 vs. 5 0.580 (P_0.06)
- 4 vs. 6 0.735 (P_0.01)
- 5 vs. 6 0.631 (P_0.037)

023

Education, competency, and assessment

Using Simulation to teach Non-technical Skills in Intensive Care

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INTRODUCTION: Intensivists face delicate conversations at family conferences and engage in negotiations about patient care on a frequent basis. In addition, a significant part of the job involves event management during acute medical crises. Yet, training opportunities for these non-technical aspects of Intensive Care practice are difficult to deliver reliably in clinical settings. We report on a pilot course developed for ICU trainees as part of a wider initiative funded by the Commonwealth of Australia aimed at promoting non-technical skills (NTS) relevant to specialist training using synthetic learning environments.

METHODS: We developed and delivered a program incorporating presentations, interactive workshops and scenarios using simulated patients, hybrid and high fidelity simulation. The areas of advanced communication (breaking bad news, open disclosure, conflict resolution, end-of-life (EOL) care) and crisis response were chosen as particular NTS pertinent to ICU practice. 11 trainees piloted the 2-day course, participating in family conferencing and crisis scenarios with varying objectives. The course was evaluated through participant pre and post-course questionnaires including 4-point Likert scale responses and written comments. Responses were analyzed using the Wilcoxon signed ranks test.

RESULTS: Participants were unanimous in recommending the course to colleagues. While few had prior formal instruction on crisis management (28%) or team-leading (36%), all agreed that these topics were well-suited to the simulation environment and 91% felt they had the opportunity to practice skills they otherwise were not able to during their training. Obtaining immediate feedback about their performance was valuable to their learning experience. By the end of the course, all participants reported confidence in breaking bad news and discussing EOL decisions (pre 73%, p_0.063). The proportion of participants comfortable with discussing legal aspects of EOL care increased from 40% to 80% (p_0.063). Overall the pilot course rated highly for relevance, realism, course quality and simulation experience, with a trend for improving trainees' confidence in conducting difficult family discussions. Consequently, the formal ICU training body is reviewing the course for future development.

DISCUSSION/CONCLUSIONS: Simulation can be used successfully to address the gaps in training opportunities for some of the critical non-technical aspects of ICU practice.

J.S. Chan, Commonwealth of Australia, Independent Contractor, Intellectual Property Rights; Australian Association for Simulation in Healthcare Chapter, Independent Contractor, Intellectual Property Rights.

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Education, competency, and assessment

Overcoming Common Challenges in Simulation-Based Research Through Multi-Center Collaboration : The Birth of the EXPRESS Pediatric Simulation Research Collaborative

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INTRODUCTION: The field of simulation has made great advances over the past decade. However, simulation-based research still faces many challenges, which often leads to skeptics questioning the utility and benefit of simulation-based education and assessment. The EXPRESS Pediatric Simulation Research Collaborative was established to bring together leaders and innovators in pediatric simulation interested in answering important research questions pertaining to pediatric resuscitation and education. The aim of the EXPRESS collaborative is to conduct and facilitate high quality simulationbased research through multi-center projects.

METHODS: The EXPRESS research collaborative was formed at a meeting of pediatric resuscitation, education and simulation experts in February 2007. Since then, leaders within the collaborative have worked to expand its membership by recruiting new site investigators, video review experts and simulation consultants to help with current and future projects. The infrastructure of the collaborative has been supported by the development of an internet-based research portal, and securing a research assistant to help move research forward. The groundwork for future research has been laid by current work focused on validating 3 separate assessment tools for simulation-based research. The current research project, aimed at assessing the utility of scripted debriefing for simulation-based learning, received ethics approval at all recruitment sites.

RESULTS: During the course of our first major research project : Examining Pediatric Resuscitation Education using Simulation and Scripting (EXPRESS), we have overcome many challenges facing simulation-based researchers. The collaborative has expanded to involve 14 different pediatric recruitment centers, and over 50 collaborators and video review experts from across Canada, United States of America, Japan and Australia. Using our combined input and experience, our group has addressed the issue of small sample size in simulation-based research by recruiting from multiple pediatric centers, and has overcome barriers in assessment tool design and validation by seeking expert advice from amongst our team of researchers. We have tackled and answered questions related to compatibility of audiovisual equipment across multiple centers. Potential logistical problems such as video review and data collection have been overcome by the creation of a multi-functional and universally-applicable research portal linked to a Learning Management System. Using this portal, our team of 24 video reviewers will be able to access over 500 different videos to review, and then input their ratings of performance for further statistical analysis. To address the issue of authorship, we have formed a manuscript oversight committee, responsible for ensuring equitable academic recognition of all individuals involved in research.

CONCLUSION: The EXPRESS pediatric simulation research collaborative has brought together simulation experts from around the world as part of its first major multicenter research project. The infrastructure developed for the first project will allow for a seamless transition to future research projects for the collaborative. We hope that the EXPRESS pediatric simulation research collaborative will help to build momentum for simulation-based research on an international level.

A. Cheng, American Heart Association - Research Grant, Other Activities, Other Financial Benefit.

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Education, competency, and assessment

Successful Integration of a Simulation-Based Pediatric Acute Care Curriculum into a Pediatric Emergency Medicine Fellowship Training Program

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INTRODUCTION: Currently, many pediatric hospitals around the world are using simulation technology to teach residents and fellows the cognitive, behavioural and technical skill sets required to effectively succeed in managing critically ill patients (1,2). We have developed and evaluated a simulation-based, acute care curriculum and have integrated it into our current pediatric emergency medicine fellowship training program.

METHODS: Using the Royal College of Physicians and Surgeons of Canada learning objectives for PEM Fellowship as a guideline, 13 clinical modules were developed to address various skillsets for pediatric emergency medicine fellows. Clinical modules, composed of 3 or 4 individual scenarios, were run with each scenario followed by structured debriefing. Six modules were identified as "core" modules, allocated for completion in year 1 of fellowship, while 7 other modules were "subspecialty" modules, designed for completion in year 2 fellowship. A 13 question survey (5 point Likert Scale) was used to evaluate participant satisfaction with regards to realism of the scenario (3 questions), structure of the debriefing session (3 questions), quality of instructors (3 questions), and overall quality of the simulation (4 questions).

RESULTS: A total of 66 surveys were collected over a 5 month period. Fellows agreed that simulations were realistic (average score 4.40). The debriefing sessions were found

to be a positive learning experience, which helped learners to consolidate what they had experienced during the scenario (average score 4.45). Instructors were enthusiastic, knowledgeable, and provided a safe learning environment (average score 4.79). PEM fellows enjoyed learning in a multidisciplinary team, found training at the simulator useful, and thought that it should be a mandatory part of their education (average score 4.84).

CONCLUSION: We have successfully integrated a simulation-based acute care curriculum into our PEM fellowship program with high satisfaction ratings. Future research will need to be done to assess educational outcomes related to this curriculum.

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A. Cheng, American Heart Association - Research Grant, Other Activities, Other Financial Benefit.

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Education, competency, and assessment

Examining Pediatric Resuscitation Education Using Simulation and Scripting : The EXPRESS Pediatric Simulation Research Collaborative

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INTRODUCTION: Standardized resuscitation courses, such as PALS, ACLS and NRP are poised to incorporate high fidelity simulation-based learning into their curricula. The full incorporation of simulation into advanced life support courses will increase the

need for instructors with high-quality debriefing skills to help facilitate the learning process. We have developed a simple, easy-to-use, “debriefing script” by expert consensus, targeted to typical novice PALS instructors. Our collaboration of pediatric resuscitation experts are evaluating the effectiveness of scripted vs. unscripted debriefing by novice instructors to teach critical medical knowledge, behavioral and leadership skills. The full incorporation of simulation into advanced life support courses depends upon the ability of simulation education to promote retention of knowledge and skills in students who take these courses. We also hope to evaluate the effect of high fidelity simulation on learning compared with low fidelity simulation for PALS-related learning outcomes.

METHODS: Our study utilized a prospective, randomized control, factorial study design with pre and post-testing to assess performance outcome measures. Subjects were recruited from 13 pediatric tertiary care centers across North America. Novice instructors recruited to participate in the study were asked to facilitate a teaching session for a multidisciplinary code team. Instructors and teams were randomized into one of 4 groups. In total, we recruited 12 instructors/teams per study arm (n_48). In study arm 1, the instructor ran a pre-determined PALS-based scenario on a low fidelity mannequin followed by a non-scripted debriefing. Study arm 2 utilized low fidelity simulation followed by a scripted debriefing. Study arms 3 and 4 were high fidelity arms followed by non-scripted and scripted debriefings, respectively. Outcome measures were assessed by evaluating 3 categories of performance. Cognitive performance and knowledge during both the pretest and posttest phase were assessed using multiple choice testing and a Cognitive Performance assessment Tool (CPT). Behavioural performance by the team leader was assessed using the Behavioural Assessment Tool (BAT).

RESULTS: 48 teams of 213 subjects were recruited to participate in the study. Scripted debriefings were associated with larger improvements in MCQ test scores (post-pre) than unscripted debriefings (p_0.0001). The use of high fidelity simulation was also associated with larger improvements in MCQ test scores (post-pre) than with the use of low fidelity simulation. The use of scripting with low fidelity simulation resulted in a more significant improvement in MCQ scores compared with the use of scripting with high fidelity simulation. The mean CPT scores of the scripted/high fidelity simulation groups were higher compared to the unscripted/low fidelity groups, but this was not found to be statistically significant (p_0.125 and p_0.076 respectively). Scripting and fidelity had no effect on team leader’s BAT scores.

CONCLUSION: Our study suggests that both scripted debriefings and high fidelity simulation may be used effectively to improve knowledge acquisition for PALS-based learning outcomes. In particular, scripted debriefing seems to have a profound effect on improving knowledge acquisition with low fidelity simulation, suggesting that this tool may be helpful if implemented into current resuscitation courses such as PALS.

A. Cheng, Research Grant - American Heart Association, Other Activities, Other Financial Benefit.

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Education, competency, and assessment

Evaluation of Surgical Skills in Senior Medical Students on a Surgical Career Track, Using Simulated Clinical Tasks to Measure Junior Clerkship Experiences

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INTRODUCTION: The development of realistic patient simulators has made it possible for students and residents to practice a variety of clinical skills in a safe environment before being asked to use those skills in an actual patient-care setting. The use of simulation in Objective Structured Clinical Examinations (OSCE's) also allows a standardized assessment of clinical skills. As part of an initiative to improve undergraduate surgical education at our institution, we are using an OSCE prior to the start of the fourth year sub-internship to assess the clinical knowledge and skills of fourth year medical students considering a career in general surgery. This also provides a way to evaluate the quality of the third year surgical clerkship, in an effort to improve that curriculum as well.

METHODS: We created an exam to test students in 6 different clinical tasks that we considered to represent important learning objectives in both surgical education and, ultimately, surgical internship. These tasks were incision and drainage of an abscess, arterial line insertion, radiologic interpretation, advanced suturing techniques, sterile gowning and gloving, and surgical instrument identification. Nineteen students rotated through each of 5 stations, with 15 minutes allotted for each encounter. Each encounter was then scored on a point system established prior to the examination, and the scores calculated. Percent scores were calculated for the exam as a whole, as well as for each of the 6 skills examined.

RESULTS: Student scores for the exam as a whole ranged from 40.2% to 82.1% (mean 66.1%_10.7%, median 68.4%). There was a wide variation of scores within individual categories, with standard deviations as high as 25.9%. The highest scores across all stations ranged from 80%_100% (mean 95.6%_7.8%, median 98.3%). Most students appeared to be proficient at gowning and gloving, with that category representing the personal best for 11 of 19 students. Scores for this task ranged from 60% to 100% (mean 87.4% _ 13.27%, median 90%). The lowest scores ranged from 20% to 60% (mean 32.8% _ 17.5%, median 23.4%) across all categories. There was no task that stood out as one at which students consistently performed poorly.

CONCLUSIONS/DISCUSSION: Simulation is rapidly becoming an essential part of medical education. At our institution, the implementation of an OSCE has given us an opportunity to objectively assess the clinical skills that 4th year students learned during their 3rd year clerkship in surgery. Scores within individual categories varied greatly, indicating a wide range of experience and clinical skill among the students. This may be an indication that clinically, the 3rd year education is not uniform. Perhaps the 3rd and 4th year curriculums could be tailored to getting all students on the same level clinically. Further studies are needed to better delineate these findings.

J.A. Comeau, None.

Virtual Patient Computer Simulations: A Systematic Review and Meta-Analysis

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INTRODUCTION: Educators increasingly use virtual patients (computerized clinical case simulations; VPs) in health professions training. A comprehensive synthesis of evidence may inform VP use. We sought to summarize the effect of VPs for health professions learners in comparison with no intervention and alternate instructional methods, and elucidate features of effective VP design, by conducting a systematic review.

METHODS: We systematically searched MEDLINE, EMBASE, CINAHL, ERIC, PsychINFO, and Scopus through February 2009 for articles on VPs. We included all original research in any language describing VPs for practicing and student physicians, nurses, dentists, and other health professionals. We worked independently, in duplicate, to select articles and extract data on participants, research design, VP design, and outcomes; interrater agreement was good to excellent (kappa ≥ 0.70 in nearly all instances). For comparative studies, we performed meta-analyses using a random effects model to pool Hedges' g effect sizes.

RESULTS: We found 98 descriptive, 4 qualitative, 18 no-intervention controlled, 21 media-comparative, and 11 computer-assisted instruction-comparative studies. In comparison with no intervention, the pooled effect size (95% confidence interval; number of studies) was 0.94 (0.69–1.19; N_{11}) for knowledge outcomes, 0.80 (0.52–1.08; N_5) for clinical reasoning, and 0.90 (0.61–1.19; N_9) for other skills. In comparison with non-computer instruction, the pooled effect size (positive numbers favoring VP) was -0.17 (-0.57 to 0.24 ; N_8) for satisfaction, 0.06 (-0.14 to 0.25 ; N_5) for knowledge, -0.004 (-0.30 to 0.29 ; N_{10}) for reasoning, and 0.10 (-0.21 to 0.42 ; N_{11}) for other skills. Subgroup analyses for both comparison types failed to provide evidence informing VP design and use. However, randomized comparisons of different VP designs suggest that repetition until demonstration of mastery, advance organizers, enhanced feedback, and explicitly contrasting cases can improve learning outcomes. Qualitative studies have identified relative advantages for VPs including student independence, learning efficiency, accommodation of schedules, and stress-free learning environment, and note that students generally advocate group rather than individual case completion.

DISCUSSION/CONCLUSIONS: This study was limited by the quantity and quality of available studies and by large heterogeneity ($I^2_{50\%}$) in most analyses. It nonetheless appears that VPs are associated with large positive effects compared with no intervention, while effects in comparison with non-computer interventions are on average small. Features such as mastery learning, advance organizers, enhanced feedback, explicitly contrasting cases, and working in groups may enhance VP instructional design. Few studies have directly compared different VP designs or used rigorous qualitative analysis to explore VP use, and further research of this sort is needed to clarify how and when to effectively employ VPs for training health professionals.

D.A. Cook, None.

Assessing Thinking and Practice Skills Through Analysis of Simulation Scenario Video Recordings

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INTRODUCTION: Assessment in simulation often involves examining the learner's demonstration of psychomotor or interpersonal skills. Video recordings of scenarios allow learners to reflect on their performance during debriefing. However, recordings also provide researchers with opportunities to analyze specific aspects of performance in simulation scenarios. This paper is a report on the analysis of recordings of second and third year baccalaureate nursing students for thinking skills and performance of nursing care.

METHODS: Students performed scenarios in the simulation laboratory with mannequins as part of the clinical expectations of their program. The scenarios involved Year 2: Assessment of Older Adults and Newborn Assessment, Year 3: Adult Respiratory Care, and Adult Post-operative Care. Thinking processes were analyzed using Donald's Model of Thinking Processes (Donald, 1992; 2002) identifying processes of Description, Selection, Inference, Synthesis and Verification. Performance of nursing skills were assessed using the categories: (1) Missed elements, (2) Incorrect elements, (3) Incomplete elements, (4) Incorrect order of activities, (5) As expected (correct demonstration of psychomotor and/or communication skills) and (6) Teacher prompted.

Eighteen segments with a total duration of 1208 seconds were analyzed. Segments ranged from 18 to 133 seconds. Segments were chosen that demonstrated patient care activity and had clear audio tracks. For both thinking and practice skills assessment, 2 researchers independently assessed the students' performance on selected practice segments and then compared and reconciled results.

RESULTS: It was possible to identify a range of thinking skills in student activity, despite the fact that students had not been instructed to talk about what they were thinking or why they were taking specific actions. A total of 124 thinking skills were demonstrated ($M=7$ thinking skills/segment). *Selection* was demonstrated most frequently (39%). The second most frequently used thinking skill was *Description* (31%), followed by *Synthesis* (15%), *Inference* (8%), and *Verification* (7%). In practice skills 191 actions were assessed, the most frequent category was Incomplete (46%), followed by missed (30%) and as expected (15%). Incorrect performance of expected skills was infrequent (3%). These students were all new to the clinical area of the scenario, and while their care was less than expected, none of their actions would be likely to put a patient at immediate risk and may have been influenced by the simulation environment. For example, they might have failed to check the nameband, or record an action.

DISCUSSION/CONCLUSIONS: Recordings of simulation scenarios provide rich data on cognitive processes of learners as well as assessing performance of tasks. Having learners use a "think aloud" technique as they provide care in simulation could provide an even richer source of data on learners' thinking processes and their development of critical thinking abilities that can be carried over to provision of patient care in the practice world.

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B. Cragg, None.

030

Education, competency, and assessment

Undergraduate Nursing Students' Perceptions of High-Fidelity Human Patient Simulations

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INTRODUCTION: The use of simulation is becoming a well recognized educational method for providing clinical experiences in a safe learning environment. This study examined the undergraduate nursing students' perceptions of learning, satisfaction, self-concept, and collaboration through their repeated experiences in high-fidelity human patient simulation scenarios.

METHODS: Valid and reliable tools for data collection were developed for the 2003–2006 National League for Nursing and Laerdal Simulation Study (Jefferies, 2007). The instruments used in this study included the *NLN Simulation Design Scale*, *NLN Educational Practices in Simulation Scale*, and the *NLN Student Satisfaction and Self-Confidence in Learning*. Permission was granted to convert the paper and pencil NLN questionnaires, to an online survey medium. Seventy-eight undergraduate nursing students anonymously participated in the study while enrolled in a baccalaureate nursing program, in an Adult Health clinical course. At the beginning of the semester, the researcher provided half of the students (n=39) the “Flashlight” link to the NLN questionnaires, through the Adult Health WebCT course, to collect the “pretest” data. The pretest data were collected after the students participated in their first high-fidelity human patient simulation. A pilot study had revealed that the data collected before the students' first high-fidelity human patient simulation experience resulted in many “not applicable” answers. After the students experienced three high-fidelity human patient simulations they completed the NLN questionnaires for posttest data collection. The data collection was conducted with the second half of the nursing students (n=39), during the second half of the semester.

RESULTS: The nursing students highly rated their perceptions of the simulation design, learning, satisfaction, self-concept, and collaboration through the high-fidelity human patient simulation experiences using the Likert scale in the NLN questionnaires. The nursing students' pre/post perceptions of learning and collaboration were statistically significant (p=.022). There was no statistical significance in the nursing students' pre/post perceptions of the simulation design, satisfaction, self-concept/self-confidence. An unexpected finding was the statistically significant results in the effect of the timing in the semester and the two groups of nursing students' pre/posttest means. The descriptive statistics showed that the second group generally reported lower ratings in their perceptions, and increased their ratings slightly more through repeated high-fidelity human patient simulation experiences.

DISCUSSION/CONCLUSIONS: This study supports previous findings regarding the nursing students' consistently high ratings of their perceptions of the simulation design, learning, satisfaction, self-concept, and collaboration through repeated high-fidelity human patient simulation experiences. The statistical significance of the nursing students' perceptions of learning and collaboration support the importance of implementing effective learning methods for adult learners. Future studies should examine the effect of the timing in the semester of the high-fidelity human patient simulation,

and possible influences on the students' perceptions of the experience.

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L.L. Crouch, None.

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Education, competency, and assessment

Development of a Communication Skills Curriculum for Pediatric and Obstetric Providers Using High-Fidelity Simulation

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INTRODUCTION: Poor communication between obstetric (OB) and pediatric (Peds) providers during deliveries has been associated with perinatal morbidity and mortality¹. Simulation-based training (SBT) improves teamwork² and is advocated by the Institute of Medicine and Joint Commission^{3,4}. A standardized, multidisciplinary curriculum on communication using SBT is needed to improve patient care. Our aims were to identify areas of communication needs during high-risk deliveries, develop a tool to measure communication, and develop a multidisciplinary curriculum for OB and Peds providers using SBT to improve communication.

METHODS: To identify areas of communication needs, actual and simulated deliveries involving OB and Peds faculty, fellows, residents, mid-level providers and nurses were directly observed. Providers were also surveyed regarding their perceptions of communication practices using a standardized questionnaire scored on a 5-point Likert scale and analyzed using the Wilcoxon rank sum test. To address the identified need to improve handoff communication between teams from the needs assessment, a 20-item Checklist was developed for use during SBT. Providers participated in videotaped high-risk delivery room simulations using high-fidelity mother and newborn mannequins. Immediately following the simulations, participants reviewed the videos and discussed communication during a structured debriefing session that incorporated the Checklist items. SBT sessions were scored using the Checklist by 3 independent raters. Results were analyzed for inter-rater reliability using intraclass correlation.

RESULTS: Survey: 195 (77%) providers completed the survey. OB and Peds providers differ significantly in their perception of inter-team communication on several survey items (P range: <0.0001 – 0.05). Conversely, they perceive similar strengths and weaknesses regarding communication within their own teams. CHECKLIST: 165 (65%) providers participated in 13 SBT sessions. Teams completed only 20–65% of the Checklist items. Scores were 6.8 ± 2.7 (mean \pm SD) of a possible 20 points. The intraclass correlation was 0.86 among 3 raters. Deficiencies in inter-team communication occurred mainly (1) during calls by OB for Peds presence at deliveries and (2) during feedback by Peds to OB regarding newborn status after stabilization. Communication was variable for (1) maternal and fetal information relayed from the OB to Peds team upon arrival of Peds to the delivery and (2) from Peds providers to the newborn's family.

CONCLUSION: An ongoing collaborative, multidisciplinary educational program using SBT to improve communication practices between OB and Peds providers during high-risk deliveries is needed. Standardizing handoff communication between teams by

familiarizing providers with Checklist items may improve patient care.

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R. Dadiz, None.

032

Education, competency, and assessment

Modeling and Sizing a multidisciplinary Operating Theatre

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INTRODUCTION: The objective of our work is to model and simulate an operating theatre OT of the academic and hospitable establishment of Oran AHEO following ASCI methodology[2](Analysis, Specification, Conception, Implementation). This will help in their resources sizing. The model must fulfill dedication constraints.

METHODOLOGY: Fig.1-The global Process.

The knowledge model allows us in a first step to define decision-making, physical and logical subsystems. For that we use ARISToolset [4](Fig. 1).

In a second step, we make action model in Arena[3] to evaluate the performance of the existing multidisciplinary OT, and to size resources for such type. Our performance indicators are operating rooms use rates and beds use rates, the rate of patients treated by the system and their total stay time. The game is on some parameters such as numbers of PACU's beds, the operating rooms, and the patients arrivals in one day. For the evaluating scenario we collect parameters which are 2 operating rooms, 5 beds in PACU. We use the minimum, median and maximum value of the operating time in a Triangular distribution: Trian(45,120,660)min. The number of surgical interventions per day is 4 to 6 interventions. The time of earliest waking-up (meeting the criteria for leaving the PACU: breathing, consciousness and coloration) is between 4h. and 16h. following the Uniform law: Unif(240,960) min. For sizing, we generate other scenarios where we replace the constant arrivals rates by random values, reducing the frequent processing times by taking much more Endoscopies and Appendicites, increasing arrivals rate to create phenomena on the sub-use of rooms, decreasing the number of beds to create blockage. Our contribution in this modeling is the introduction of two dedication constraints[1]:The first is the dedication of heart patients or critical states at a particular operating room. The second is the dedication of patients judged after surgical intervention as critical states; at intensive care unit (ICU)(Fig. 2).

Fig. 2-The Action Model with constraints.

RESULTS: We can therefore conclude that:

- For interventions (45,120,660) min. and a revival of 4 hours to 16 h. a rate of 2.5 beds/room is usual, 4 interventions/day per room give the ordinary use of the OT.
- For shorter interventions, the number of beds must increase;
- Under constraints, the waiting period increases the number of interventions is less than 4 per room.

CONCLUSIONS: We presented a model of a multidisciplinary OT using the ASCI methodology. A simulation with Arena has identified necessary rates. Our current research focuses on validation of statistical tests to analyze the results, the addition of technological dependency[1], and precedence constraints and improving quality of data.

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Education, competency, and assessment

The Influence of Simulation-Based Physiology Labs Taught by Anesthesiologists on the Attitudes of First-Year Medical Students Towards Anesthesiology

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BACKGROUND: The development of medical students' perceptions of different medical specialties is based on many factors and influences their career choices and appreciation of other practitioners' knowledge and skills. The goal of this study was to determine if participation in a series of anesthesiologist-run, simulation-based physiology labs changed medical students' perceptions of anesthesiologists.

METHODS: One hundred first-year medical students were surveyed at random three months before completion of a simulation-based physiology lab run by anesthesiologists. All participants received the same survey instrument, which employed a Likert Scale to rate the appropriateness of several descriptive terms as they apply to a particular specialist or specialty. A post-simulation survey was performed to track changes in attitudes.

RESULTS: Response rates to the survey before and after the simulation labs were 75% and 97%, respectively. All students who filled out the post-simulation surveys had been exposed to anesthesiologists in the prior three months whereas none had interacted with surgeons in the interim. No changes in the medical students' perceptions of surgeons were evident. Statistically significant changes were found for most descriptors of anesthesiologists, with a trend towards a more favorable perception after participation in the simulation program (Table 1).

Pre and post-simulation scores are reported as mean scores on a Likert Scale. P-values are based on Wilcoxon 2-sample test comparisons of pre and post-simulation survey data.

CONCLUSIONS: Using a survey instrument containing descriptors of different medical specialists and specialties, we found an improved attitude towards anesthesiology after medical students participated in an anesthesiologist-run simulation-based physiology lab series. Given the importance of providing high quality medical education and attracting quality applicants to the field, integration of anesthesiology staff into

medical student courses at the non-clinical level appears useful.

S. DeMaria, None.

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Education, competency, and assessment

Pilot Study Tracking Laryngoscope Motion During Infant

Manikin Intubation

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INTRODUCTION: Opportunities to learn and maintain specialized pediatric intubation skills are restricted by limited frequency and urgent circumstances. This pilot study investigates whether laryngoscope motion tracking technology can be used to differentiate expert vs novice providers' techniques during endotracheal tube insertion in infant manikins.

METHODS: Institutional Review Board waiver was obtained. Each of 11 experts (nurse anesthetists or anesthesiologists) and 11 novices (medical students) intubated an infant manikin head (Laerdal) 10 times. Laryngoscope motion was tracked using the Flock of Birds electromagnetic technology (Ascension Technology Corp.) during consecutive phases: (1) Time from acquisition of laryngoscope to oral insertion (2) Insertion of laryngoscope to stable laryngeal visualization; and (3) Stable laryngeal visualization to insertion of endotracheal tube and withdrawal of laryngoscope from mouth. 213/220 data files were complete and analyzable. Expert vs novice rate of success, motion path length, laryngoscope blade angle and time in each phase were compared using univariable binomial regression, independent sample t-test and Pearson chi square as appropriate.

RESULTS: Intubation success rate was greater for experts (105/105_100% vs novices 101/108_93.5%; Risk Ratio_0.92, p_0.001). Expert path of motion was longer (mean 39 SD_25 vs 29 SD_16 cm, p_0.001). Experts were more likely to achieve an optimal blade angle (e.g. angle associated with best likelihood of success; RR _ 1.05, 95% CI _ 1.05–1.06, p_0.0001). Time from insertion to withdrawal of laryngoscope from the mouth was greater for experts (mean 14.0, SD_5.9 vs 11.4 , SD_5.9 sec, p_0.002). Experts accomplished phase 3, endotracheal tube insertion, more quickly (mean 4.2 SD_1.6 vs 5.1 SD_2.2 sec, p_0.001).

DISCUSSION/CONCLUSIONS: This pilot study demonstrates the feasibility of tracking laryngoscope motion during manikin intubation to compare expert vs novice procedural technique. Experts had a greater success rate, and were more likely to achieve an optimal blade angle than novices, but were not always faster performing manikin intubation. Motion tracking technology may provide a tool to improve techniques of intubation.

E.S. Deutsch, None.

Table 1. Pre and post-simulation perceptions of surgeons and anesthesiologists

Descriptor

Surgeon

p-value

Anesthesiologist

p-value

Mean

score
pre-sim
Mean
score
post-sim
Mean
score
pre-sim
Mean
score
post-sim

Devoted 4.2 4.3 0.60 3.6 4.0 **0.018**
Intelligent 4.4 4.4 0.48 4.2 4.5 **0.024**
Compassionate 2.9 3.0 0.94 3.1 3.6 **0.002**
Hard-working 4.6 4.7 0.35 3.7 4.1 **0.02**
Approachable 2.7 2.7 0.99 3.4 3.9 **0.0003**
Focused 4.5 4.6 0.64 4.2 4.3 0.71
Confident 4.7 4.8 0.42 4.1 4.4 **0.04**
Dexterous 4.7 4.8 0.37 4.1 4.5 **0.03**
Influential/ leader 4.1 4.3 0.13 3.4 3.8 **0.012**
Problem-solver 4.0 4.2 0.30 4.0 4.4 **0.006**

035

Education, competency, and assessment

Out of Sight: an Innovative Approach to Teaching Rectal Examination

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INTRODUCTION: Digital rectal examination (DRE) is challenging to teach and learn because; 1. During the internal part of the examination, the teacher is unable to see the movements of the learner's examining finger or to appreciate what they are feeling, 2. some experts find it difficult to verbally articulate their method and 3. learning through long periods of clinical exposure is not a feasible option for a modern medical workforce. Cognitive task analysis (CTA) is a process which captures an expert's skill using interview and systematic observation to deconstruct it into component steps. Our aim was to use CTA to create a standardised framework to assist novices learning DRE.

METHODS: A 'cut-away' bench-top rectal model (figure 1) was amalgamated with a model patient and clinical scenario to simulate an outpatient encounter. Each clinician performed 2 DREs, with the 'patient' in the left lateral position; one, interacting with the model as if in a real clinical encounter and another, describing their steps to an observer. Audio recording and dual aspect video-recording were performed and data analysed by two independent raters.

RESULTS: We report a dataset of 20 clinicians (9 general surgeons, 4 gastroenterologists, 2 urologists and 5 GPs). Using the audio recordings and the dual visual perspectives captured by the two cameras, each examination was deconstructed into component steps. Analysis revealed a variation in focus and approach between clinicians. The individual CTA data was then merged to form a standardised guide to DRE which was edited and ratified by senior clinicians from the major specialties involved.

DISCUSSION/CONCLUSIONS: This innovative use of CTA is an effective

method of creating a 'gold standard' guide for DRE which we hope will assist with teaching and learning of this important skill.

A.N. Di Marco, None.

036

Education, competency, and assessment

Impact of a Central Line Workshop on resident performance during simulated central line placement

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INTRODUCTION: Central Line Workshop (CLW) was designed to improve safety of central line placement. CLW impact has not been verified and the optimal frequency is unknown. Central line performance should improve following the CLW; while some skill decay may occur in the months after CLW, performance should be still be improved compared to baseline.

METHODS: Between November 2008 and May 2009, Emergency Medicine residents were assessed at baseline, atCLW3 months later, and postCLW 6 months after baseline. After completing online prerequisites, CLW participants rotated through three stations focusing on anatomy review with practice on a cadaver model, ultrasound, and draping/sterile technique. An identical assessment station involving both internal jugular and subclavian catheterization on a simulated task-trainer was completed preCLW, at CLW, and postCLW. Video-assisted performance assessment used a validated CVC Proficiency Scale by an examiner (YD) who had no prior exposure to any of the residents.

RESULTS: After the CLW, performance composite scores (0.6 vs. 0.93, $p_{0.05}$, calculated as the percentage of items performed correctly) and procedure time (21.3 vs. 21 minutes, $p_{0.85}$) were improved after CLW (see Table 1). However, performance decay was noted postCLW. While the post CLW scores were lower than those at the CLW, there was an overall improvement compared to the preCLW baseline (0.6 vs.0.8, $p_{0.05}$; 21.3 vs 19.6 minutes, $p_{0.05}$).

DISCUSSION: Using a previously validated instrument, resident performance was substantially improved by the CLW. A lesser improvement was also noted preCLW to postCLW, but the scores decreased in the 3 months after the CLW. Whether the pre-CLWto postCLW improvement is from theCLWor from additional clinical experience is unclear. It is possible that repeated exposure to the CLW might better maintain competency, but this must be balanced by the resources required for such a simulated experience.

Y. Dong, None.

Table 1

Variable

(median, range) PreCLW (n_26) CLW (n_25) PostCLW (n_23)

Composite Score 0.6 (0.4–0.8) 0.93 (0.73–1)_ 0.8 (0.53–1)_

Time (min) 21.3 (11.7–32.1) 21 (15.7–26.3) 19.6 (12.9–28.8)_

_ $p_{0.05}$

037

Education, competency, and assessment

Simulation-based Airway Workshop Improves Critical Care Fellows' Airway Management Skills

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INTRODUCTION: Critical care airway management is a skill required of all intensivists. In our institution this is taught with supervised experience in the intensive care unit and operating room utilizing live patients. We recently introduced a scenariobased introductory airway management course for all critical care fellows prior to patient exposure.

METHODS: A one-day scenario-based airway management workshop was attended by all 16 first-year critical care fellows during their fellowship orientation. The course consists of on-line lectures, mentored airway management scenarios using freshthawed cadavers as the model, and evaluation scenarios using high-fidelity simulation mannequins as the model. Performance was rated using a 15-item checklist based on accepted methods of airway management in our institution. One day before the workshop learners' baseline skill was evaluated using a standardized scenario in a simulated ICU setting. Pre and post-course self-assessments of airway management skills were also evaluated using a 4-point scale (1_very uncomfortable,, 2_uncomfortable, 3_comfortable, 4_very comfortable). The composite scores were calculated for survey scores and completed checklist items. Analysis is performed using Student's T-test and Wilcoxon test for non-parametric variables.

RESULTS: Critical Care fellow's performance skill and perception of their airway management skill significantly improved after the airway workshop (Table 1). Selfassessment scores are reported as a composite using the four-point scale to evaluate twelve aspects of airway management. Skill performance scores are reported as the total number of correct actions using a fifteen-point skill assessment checklist.

DISCUSSIONS: Simulation based airway workshop can improve critical care fellow's sense of comfort and performance of airway management in a simulated ICU setting. It offers a unique experience for synthesis of knowledge, skill and attitude in a risk-free environment with the goal to improve patient safety and quality of the care. Future study is needed to evaluate the impact of the workshop on clinical outcome.

038

Education, competency, and assessment

Development and validation of a clinical scoring tool for simulated pediatric resuscitation: a report from the EXPRESS Pediatric Research Collaborative

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CANADA, 3Primary Children's Medical Center, Salt Lake City, UT, 4FAIMER, Philadelphia, PA, 5Children's Hospital, Boston, MA, 6Yale - New Haven Children's Hospital, New Haven, CT, 7Hasbro Children's Hospital, Providence, RI, 8A.I. Dupont Hospital for Children, Wilmington, DE, 9Uniformed Services University of the Health Sciences, Bethesda, MD, 10Children's Hospital at Dartmouth, Hanover, NH, 11Hospital for Sick Children, Toronto, ON, CANADA, 12Children's Hospital at Westmead, Westmead, AUSTRALIA.

Development and validation of a clinical scoring tool for simulated pediatric resuscitation: a report from the EXPRESS Pediatric Research Collaborative

BACKGROUND: Examining Pediatric Resuscitation Education through Simulation and Scripting (EXPRESS) is an American Heart Association funded multicenter research trial involving a pediatric resuscitation scenario scored with multiple instruments to assess the effect of high-fidelity versus low-fidelity simulation and standard versus scripted debriefing. The Clinical Performance Tool (CPT) is an instrument using a trichotomous scoring system to assess clinical performance along a continuous scale. We sought to evaluate the reliability and validity of the CPT.

METHODS: A single, 3-phased pediatric resuscitation scenario (hypovolemic shock ventricular fibrillation return of spontaneous circulation) was created for the trial. Eight teams of participants completed the scenario twice, before and after a 20-minute debriefing session (PRE and POST); two distinct introductions were utilized to maintain the appearance of a 'new' scenario. All eight sessions (16 scenarios) were videorecorded and scored by seven raters. The CPT uses a task-based scoring system according to Pediatric Advanced Life Support guidelines, with possible scores of 0, 1, or 2 points; scoring definitions account for task performance, quality, timeliness, and sequence. Scores were calculated as a proportion of total points available (21 tasks, 2 points each; maximum possible score 42 points.) Reliability was assessed by calculation of overall interrater reliability; validity was assessed by a repeated measures analysis of variance (ANOVA) comparing scores PRE and POST.

RESULTS: Complete data was available from all seven raters. Mean scores across all teams improved from PRE to POST (46.7 versus 49.7, $p=0.0001$). By repeated measures ANOVA, POST performance was significantly better than PRE ($F_{4,64}$, $p=0.05$). Overall interrater reliability for the total score was 0.63.

CONCLUSIONS: The CPT scored clinical performance in a valid and reliable manner. Forthcoming analyses from the EXPRESS Trial will include association between CPT scores and later time points for study sessions as well as between the CPT and additional scoring instruments. Further studies should assess the applicability of such instruments to actual patients.

A. Donoghue, None.

Table 1

Composite Score Pre-workshop Post Workshop p value

Self-assessment 28.3 _ 6.9 42.1 _ 4.2 _0.01

Skill Performance 6.9 _ 2.7 13.3 _ 1.7 _ 0.01

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039

Education, competency, and assessment

Errors In Endotracheal Intubation Technique: A Simulationbased

Needs Assessment

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BACKGROUND: Endotracheal intubation is an infrequent procedure in pediatrics. Clinical experience in intubation for pediatric trainees is dwindling, and data supporting the efficacy of existing training methods is lacking. Video laryngoscopy (VL) is a technology used in anesthesia with limited experience in emergency intubation or pediatrics. Evidence exists in pediatric anesthesia that VL leads to faster endotracheal intubation and fewer intubation failures in simulated pediatric patients. We sought to assess the feasibility of VL as an adjunct to intubation training sessions for inexperienced intubators in characterizing causes of first-attempt intubation failure.

METHODS: Residents underwent a single study session where they performed one intubation each on three simulators of different 'ages' (SimNewB, SimBaby, and Air-Man, Laerdal Medical). The sequence of intubations was randomized. Apneic threshold for desaturation (0 sec, 30 sec, 60 sec, and 120 sec) and the presence or absence of pharyngeal swelling were selected randomly for each intubation. Intubations were performed using a video laryngoscope (Karl Storz Endoscopy Inc.) with the video screen turned off, i.e. as a standard laryngoscope. Three synchronized video feeds (2 external webcams and the video laryngoscope) were recorded. Two raters reviewed the synchronized videorecordings and identified errors in technique from a checklist of common technical errors. In cases of first-attempt failure, raters were asked to choose the predominant cause for failure (problem with patient positioning, problem with laryngoscopy technique, problem with endotracheal tube handling).

RESULTS: 8 residents completed the study. Overall first-pass success was 5/8 in the neonatal simulator, 6/8 in the infant simulator, and 3/8 in the adult simulator. Most common errors committed were improper bed height (24/24 first attempts), 'rocking' motion with the laryngoscope (20/24 first attempts), and poor head position of the simulator (12/24 first attempts). The predominant cause for first-pass failure (n=10 total) was related to laryngoscopy technique in 8/10 cases and endotracheal tube handling in 2/10 cases. Concordance between the two raters for predominant cause of failure was 100%.

CONCLUSIONS: VL is a feasible adjunct to intubation training in helping identify technical errors committed during simulated intubations. Future studies should focus on the use of VL for individual training and feedback.

A. Donoghue, None.

040

Education, competency, and assessment

Are Surgical Simulation Skills Transferable Among Different Subspecialties? Examination of Laparoscopic Experience on Endovascular Performance

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INTRODUCTION: Minimally invasive techniques are increasingly incorporated in surgical residency training, requiring novel methods for skills training. Laparoscopic and endovascular procedures are amenable to simulation training and are felt to require a similar skill set; employment of visuospatial-manual coordination skills and transition of 3-d space to 2-d imaging. We examined whether the laparoscopic experience acquired during general surgery residency improves endovascular performance utilizing high-fidelity simulation.

METHODS: Study methodology and design was approved by our IRB. The technical performance of 22 surgical residents applying for vascular fellowship was assessed using representative laparoscopic (peg transfer) and endovascular (renal artery stenting) simulations. Residents were surveyed and categorized into 2 groups based on self-reported endovascular experience (high/low), then further subdivided based on their laparoscopic experience (high/low). High experience was defined as ≥ 100 laparoscopic or ≥ 20 endovascular cases. Endovascular performance was measured using objective simulator-generated parameters and a previously validated structured global assessment scale.

RESULTS: High self-reported endovascular experience resulted in superior performance on the endovascular task (total global assessment score 2.86 vs 2.18, $p=0.01$). Similarly, high self-reported laparoscopic experience resulted in superior performance on the laparoscopic task (peg-to-peg transfer score 79.7 vs 71.1, $p=0.03$; time 110 vs 130 sec, $p=0.03$). However, laparoscopic experience and performance did not translate to better endovascular performance in terms of objective parameters and global assessment scores (Table 1).

DISCUSSION/CONCLUSIONS: Simulation-based assessment of laparoscopic and endovascular skills correlates with respective self-reported operative experience. In our trainee cohort, neither laparoscopic experience, nor demonstrated laparoscopic skills on a simulator translated to improved endovascular performance. The absence of skills cross-over between groups provides support for specialty-based integrated residency programs in vascular surgery. In addition, increased use of simulation could enhance interest level and preparation of students considering accelerated and more efficient vascular training programs.

REFERENCES (Optional):

M.M. Dua, None.

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041

Education, competency, and assessment

Development and Validation of a Multiple Choice Examination Assessing Cognitive and Behavioural Knowledge of Pediatric Resuscitation: A Report from the EXPRESS Pediatric Research Collaborative

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INTRODUCTION: Assessing the knowledge of Pediatric Advanced Life Support (PALS) based learning objectives of medical trainees is an important evaluation component for both residency programs and for research studies. Multiple-choice examinations are one method to assess the knowledge necessary for resuscitation. In this pilot study, a multiple-choice examination was developed and validated for use in a larger pediatric simulation resuscitation study (EXPRESS study).

METHODS: Two multiple-choice exams (20 question stems, 4 potential answers) were developed by experts in pediatric resuscitation. The two examinations had slight differences in question stems but were otherwise identical. A set of pre-determined

learning objectives was used to develop questions. Questions examining cognitive knowledge were taken from the PALS database of multiple-choice examinations. In addition, 5 questions on crisis resource management (CRM) skills were developed by expert consensus. Residents from pediatrics, emergency medicine and anesthesia from a single center were voluntarily recruited to participate in the study. Each resident wrote one exam and the results were anonymous. The scores of the examinations were analyzed to determine relationships between score and test version, resident specialty and year of training. Analysis was performed by 2 sample independent t-tests (after normal distribution was determined by Levene's test) and $p_{0.05}$ was considered statistically significant.

RESULTS: 48 residents participated in the study, 8 in pediatrics, 19 in anesthesia and 21 in emergency medicine. There was no significant difference in scores between the two test versions ($p_{0.742}$). The average score was 12.7/20 (63.4%). There was no difference in scores between pediatric (63.1%), anesthesia (60.0%) or emergency medicine residents (63.4%). Senior residents (post graduate years 3, 4 and 5) from all specialties scored significantly higher than junior residents (66.3% vs. 59.5%; $p_{0.03}$)

DISCUSSION: In this pilot study, a shortMCQexamination was developed and then validated by residents in different specialties. The resultantMCQdemonstrated reasonable construct validity in differentiating between junior and senior trainees. This MCQ test is a valid tool to assess cognitive and behavioural knowledge of PALS-related learning objectives.

J. Duff, None.

042

Education, competency, and assessment

Comparison of Nursing Student Performance Assessment Using Videotaped Vignettes and High-Fidelity Human Simulation: A Pilot Study

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INTRODUCTION: Videotaped vignettes (VTV) and high-fidelity human simulation (HFHS) move beyond conventional assessment to identify areas of deficiency in simulated environments. The aims of this study were to: 1) compare the utility of VTV and HFHS in evaluating students' simulation-based performance; 2) identify specific performance deficiencies; and 3) compare students' perceptions of their experience.

METHODS: Participants were 20 nursing students rated using the VTV/HFHS Assessment Tool while performing a simulation-based assessment using VTV and HFHS.

The tool rated overall performance and six subcategories. Participants also identified positive and negative perceptions regarding the experience during a debriefing session.

RESULTS: Few participants met overall VTV (30.0%) or HFHS (10.0%) expectations. There was no statistically significant difference in participants' overall performance based on method of assessment. Regardless of assessment method, participants had difficulty with subcategory performance including recognizing the clinical problem, reporting clinical data, and anticipating orders. Participants initiated independent interventions ($p_{0.014}$) and reported patient symptoms ($p_{0.002}$) more often in HFHS and reported pertinent lab values more often ($p_{0.007}$) in VTV. Feedback from the debriefing indicated that participants felt HFHS provided a better assessment of their individual weaknesses.

DISCUSSION/CONCLUSIONS: Both VTV and HFHS were useful in identifying those who had difficulty recognizing the clinical problem, reporting clinical data and anticipating orders. While participants scored higher in performing tasks associated with initiating independent nursing interventions and reporting patient symptoms in HFHS, further research is needed to determine which simulation-based testing method better reflects skills needed in clinical practice.

REFERENCES (Optional):

L.J. Fero, None.

043

Education, competency, and assessment

Maternal Cardiac Arrest Simulation: Critical Care Fellows'

Knowledge, Performance and Self-confidence

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Care Medicine Beth Israel Medical Center, New York, NY.

INTRODUCTION: Our primary objective was to evaluate knowledge, performance and self-confidence among Critical Care Medicine (CCM) fellows in resuscitating a pregnant patient. Secondly we aimed to determine the perceived utility of simulation training.

METHODS: An interdisciplinary critical care and maternal fetal medicine team designed and implemented a standardized maternal cardiac arrest simulation. Seven CCM fellows were called individually to a mock labor and delivery room and presented with a pulseless, unresponsive term pregnant patient (NOELLE, Gaumard Scientific). Additional information was available as requested and continuous fetal heart rate tracing was provided. The scenario finished at 8 minutes with programmed maternal mortality.

Video review by a critical care attending was used to score checklist task completion and measure the timing of critical tasks. A multiple-choice test evaluating cognitive knowledge of maternal resuscitation was subsequently administered and perception of the simulation experience and self-confidence were assessed. Finally, the interdisciplinary team conducted individualized detailed debriefing sessions.

RESULTS: Cognitive knowledge exceeded actual performance for tasks specific to resuscitation of the pregnant patient (table). The obstetrical team was called by 5/7 (71%) fellows. 3/7(43%) called within 2 minutes and 2/7(29%) only after 5 minutes of resuscitation. While 5/7(71%) demonstrated knowledge about performing caesarean delivery (CD) within 4–5 minutes of maternal code, 4/7(57%) only considered CD after 6–8 minutes of resuscitation. Neonatology was called by 2/7(29%). Only 2/7 (29%) felt confident managing a maternal code. All participants agreed that simulation training is valuable for emergencies, should be used regularly, helps to manage maternal code and improves teamwork.

DISCUSSION/CONCLUSIONS: CCM fellows possessed some knowledge of pregnancy-specific modifications to BLS and ACLS. However, when presented with a simulated maternal code, their performance was suboptimal. An opportunity to participate in a simulated maternal resuscitation was uniformly welcomed and may lead to

improved performance when the actual emergency is encountered.

N. Fisher, None.

044

Education, competency, and assessment

Simulation Training Compared to Lecture Alone for the Management of Magnesium Toxicity in Women with Preeclampsia: A Randomized Trial

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INTRODUCTION: To compare management of Magnesium Sulfate toxicity encountered during seizure prophylaxis for eclampsia among obstetrics and gynecology residents randomized to traditional lecture, simulation-based education alone or a combination of lecture and simulation.

METHODS: Residents (n=38) were stratified by year and randomly assigned to 3 educational interventions: SL (simulation followed by lecture), S (simulation), L (lecture). During simulation events, each resident encountered an unresponsive postpartum patient with rare shallow breathing who was receiving Magnesium Sulfate for seizure prophylaxis. All residents were evaluated during a post-education repeat simulation utilizing a standardized checklist and performance between groups was compared. At the conclusion of each simulation (both training and evaluative simulations), detailed individualized debriefing sessions were conducted by a maternal fetal medicine team. Chi square test was used for statistical analysis.

RESULTS: At post-education simulation all residents recognized Magnesium toxicity and most discontinued the magnesium infusion. However, when confronted with continued respiratory depression significantly more simulation-based intervention participants performed Bag-Mask Ventilation while waiting for help to arrive to bring the calcium gluconate and for others to arrive to assist in the management of the airway. There was no significant difference between groups in number of participants requesting calcium gluconate, but significantly fewer residents in the lecture only (L) group knew the correct dose and route of calcium gluconate administration compared to the simulation lecture (SL) group.

CONCLUSION: While basic text-book knowledge can be acquired during simulation or lecture, simulation training is superior to traditional lecture alone in teaching practical skills required for optimal management of obstetrical emergencies.

N. Fisher, None.

Education, competency, and assessment

Development and Validation of a Checklist for Use with Simulator-Based Assessment of Sexual Assault Examination Competency

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INTRODUCTION: For victims of sexual assault, a forensic examination is the first step in the process to justice. Assessment and treatment of victims and collection of forensic evidence are vital for a strong case. As the only provider of sexual assault services in a county of more than 2.3 million people, Jackson Memorial Hospital (JMH) Emergency Care Center provides 24/7 care for victims. Advanced Registered Nurse Practitioners attended a state-wide sexual assault training program, consisting of 40 hours of lectures and hands-on sessions. To augment this program, we developed a training program and checklist for use with simulator-based assessments for competence in sexual assault nurse examinations.

METHODS: A pretest-posttest design of eight participants without a control group was used. Four case scenarios were developed to assess each participant's skills, based on the most frequently encountered cases in the Roxcy Bolton Rape Treatment Center at JMH. After a baseline evaluation, participants performed forensic examinations on female and male simulators with pelvic task trainers. They were expected to conduct an interview and perform a physical examination; collect forensic evidence specific to the case scenario; and document the case, including 'bagging' and turning over evidence to a police detective.

A checklist was developed by two of the authors (MF and AT, who are expert forensic examiners) for each of the cases based on protocols from the national guidelines for sexual assault examinations, the local state attorney's office, and the local police departments and crime laboratory. Each of the two raters completed the case checklist independently. A score of at least 85% on their first case is required to be deemed competent for independent examinations. Additional scenarios provided repetitive practice. Each item on the checklist was equally weighted. A scoring scale of 0_ No attempt/done incorrectly; 1_ Partially performed; and 2_ Completely performed was used for each item. The total number of items varied by case scenario.

Within-subject differences from pretest (baseline) to posttest (outcome) were analyzed using paired *t* tests with statistical significance of *p*_.05. The participants evaluated the program using a 5-point Likert scale.

The program was approved by the Institutional Review Board. Participants were scheduled for sessions according to their work shifts and the capacities of the University of Miami-Jackson Memorial Hospital Center for Patient Safety.

RESULTS: Pre-test mean scores were 69.4 and post-test mean scores were 83.1 (*p*_.05). Checklist case mean scores were as follows: #1 (89.5), #2 (89.8), #3 (92.3), #4 (92.6). Inter-rater reliability between the two examiners for each case was .90. The demographics of the group were mean years in nursing (22.2) and mean years in emergency care (13). Participants rated the program highly in their course evaluations.

DISCUSSION/CONCLUSIONS: Use of a checklist provided an objective measure of sexual assault forensic examination competence that may be used with simulator-based assessments. A simulation curriculum that augments sexual assault forensic examination training increased the knowledge and skills of participants in four case

scenarios as well as assessed the competency of the participants.

REFERENCES (Optional):

M. Fitzpatrick, None.

046

Education, competency, and assessment

Does Learning on a Cardio-pulmonary Simulator Transfer to a Real Patient?

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INTRODUCTION: Our prior research has demonstrated that training on a cardiopulmonary simulator improves skill acquisition and retention, as evaluated by subsequent performance on the simulator. This objective of this study was to evaluate the effect of simulation training on subsequent diagnostic performance with a real patient.

METHODS: This was a prospective intervention study in which we randomly allocated 85 first year medical students to training on “Harvey”, a cardiopulmonary simulator, in one of three clinical cases of acute chest pain. Group 1 trained on a case of symptomatic aortic stenosis, group 2 trained on a case of mitral regurgitation due to cardiac ischemia and group 3 trained on a pulmonary embolism case. The cardiopulmonary simulator was programmed to provide physical findings consistent with the diagnosis. Immersive simulation sessions ran for 20 minutes and were followed by standardized debriefing on the case content and the relevant physical findings. Immediately following the training sessions, students were asked to assess the auscultatory findings of a real patient with dyspnea, who had a clear murmur of mitral regurgitation. The student’s performance on the real patient was compared between the three groups.

RESULTS: Students who had received training on the findings of mitral regurgitation (group 2) were more likely to identify the findings on the “real” patient compared with the other two groups.

Accuracy (SD) of identifying *clinical features* for a patient with MR (for groups 1,2 & 3) was 56.2 (34.3) vs. 74.0 (36.4) vs. 36.8 (33.1), $p = 0.0005$.

Accuracy (SD) of *diagnosis* for a patient with MR (for groups 1,2 & 3) was 51.6 (50.0) vs. 68.0 (45.4) vs. 29.9 (40.7), $p = 0.01$ Importantly, students trained on aortic stenosis (group 1) were better at identifying features of and diagnosing mitral regurgitation than were those who did not receive any training on systolic murmurs (Group 3). This suggests that the newly acquired skill was successfully transferred to a unique clinical presentation.

DISCUSSION/CONCLUSIONS: We have previously shown that students acquire and retain clinical skills with simulation training, and we now show that these skills are transferred to encounters with real patients.

REFERENCES (Optional):

K. Fraser, None.

047

Education, competency, and assessment

The Effects of an ACLS Simulation-Based Educational Intervention on Performance, Self-Efficacy, and General Knowledge in a Group of First-Year Nurse Anesthesia Students

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INTRODUCTION: Confronted with the difficulty of critical decision-making during an emergency, nurse anesthesia students (NAS) have the added burden of having to perform numerous psychomotor skills with high proficiency. Traditional ACLS certification may not be sufficient for effective performance and self-efficacy in ACLS. The purpose of this study was to test the following hypotheses: NAS, after a six-hour ACLS simulation-based educational intervention ($n = 32$), would have greater ACLS performance, ACLS self-efficacy, and general ACLS knowledge. There would be a correlation between select demographic variables and the gain scores of the dependent variables. Bandura's theory of self-efficacy constituted the theoretical framework that underpinned this study.

METHODS: A quasi-experimental one group pre and posttest design with participants as their own controls. The ACLS performance checklists, the Perceived ACLS Self-Efficacy (P.A.S.E.) Scale, and the ACLS Written Precourse Self-Assessment Test were the instruments used.

RESULTS: There was a statistically significant increase in both ACLS performance from pretest ($M = 67.57, SD = 9.75$) to posttest ($M = 78.35, SD = 10.82$) and perceived ACLS self-efficacy from pretest ($M = 6.95, SD = 1.36$) to posttest ($M = 8.10, SD = 0.99$), ($p < .001$, one-tailed). There was no difference in general ACLS knowledge from pretest ($M = 87.19, SD = 6.53$) to posttest ($M = 87.81, SD = 5.78$), ($p = .242$, onetailed). There was a correlation from pretest to posttest gain scores between select demographic variables and the dependent variables as follows: (a) between nursing experience (subjects with fewer years of experience had higher posttest scores, $r(31) = -.376, p = .034$) and perceived ACLS self-efficacy; (b) between nursing experience (subjects with fewer years of experience had higher posttest scores, $r(31) = -.341, p = .050$) and the ACLS knowledge subscale; (c) between nursing experience (subjects with fewer years of experience had higher posttest scores, $r(31) = -.361, p = .042$) and the ACLS skills subscale; (d) between nursing experience (subjects with fewer years of experience had higher posttest scores, $r(31) = -.356, p = .045$) and the ACLS affective behavior subscale; (e) between ACLS experience (subjects with fewer years of experience had higher posttest scores, $r(31) = -.355, p = .046$) and the ACLS skills subscale; (f) between ACLS experience (subjects with more years of experience had higher posttest scores, $r(31) = -.351, p = .049$) and general ACLS knowledge.

CONCLUSIONS: An ACLS simulation-based education can be used to provide an innovative approach to student-centered learning to improve ACLS performance and ACLS self-efficacy in a group of NAS. Select demographic variables are associated with improvements in some dependent variables.

J.E. Gonzalez, None.

048

Education, competency, and assessment

Use of Simulation in the Development of a Valid and Reliable Resuscitation Team Leadership Evaluation Tool

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INTRODUCTION: Competence as a leader of a pediatric resuscitation is challenging to assess during residency training due to the rarity of clinical opportunities as well as

the complexity of the construct of resuscitation team leader competence. With the ability to provide standardized high fidelity clinical experiences using human patient simulation, the greater challenge is now to provide educators with a valid and reliable evaluation tool. This study set out to develop such a comprehensive tool.

METHODS: Phase I: Using Delphimethodology, eight pediatric acute care experts participated in the development of a comprehensive evaluation tool. An extensive list of potential contributing items was developed from the literature and from an initial brainstorming meeting. Items were refined to produce a final evaluation tool containing only items of high importance and observability by consensus through the Delphi method. Phase II: Thirty pediatric residents were video recorded leading two standardized resuscitation scenarios on a high fidelity human patient simulator. The tool was piloted using randomly selected videos. Following piloting, three expert raters blinded to resident level of training independently rated resident leadership performance using the newly developed tool. A fourth expert rater evaluated each recording using a global rating score. Evidence for the tool's face and content validity were built through use of the Delphimethodology in the tool's creation. Criterion validity was established through correlation of evaluation tool scores with global rating scores. Construct validity was established through factor analysis, correlation of evaluation tool scores with resident level of training, and correlation of evaluation tool scores between scenarios. Evidence for reliability was built in three ways. First, internal consistency reliability was assessed using Cronbach's alpha for total scores, Part I scores, and Part II scores. Second, item analysis was used to assess contribution of each item. Finally, generalizability analysis was performed.

RESULTS: An initial list of 58 potential items was reduced through two rounds of Delphi to 26 items divided into two sub-scales: leadership and communication skills (Part 1), and knowledge and clinical skills (Part 2). Cronbach's alpha was found to be 0.818 for total scores, 0.827 for Part 1 and 0.673 for Part 2. Generalizability coefficient was 0.760, 0.844 and 0.482 for total, Part 1, and Part 2 scores respectively. A minimum of two raters and two scenarios were found to be necessary for stability of scores for the entire tool. Interrater reliability showed a medium to large strength of correlation for total scores, large strength of correlation for Part 1 scores and small to medium strength correlation for Part 2 scores. No significant difference was found for scores between scenarios. The correlation coefficient for global rating scores and evaluation tool scores was 0.702. Exploratory factor analysis supported the two subscales established in Phase I.

CONCLUSIONS: A 26-item evaluation tool with two subscales was created and tested. Evidence was built for the tool's reliability and validity, with Part 1 performing better than Part 2. These results support the ability validly evaluate pediatric resuscitation team leader competence using human patient simulation.

V.J. Grant, None.

049

Education, competency, and assessment

The Calgary WISE Course: Impact of a Dedicated Simulation

Instructor Course Pilot

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INTRODUCTION: The rapid growth of simulation-based education has resulted in a human resource crisis for most simulation centres as they try to find experienced simulation educators to perform simulation-based teaching. Given the recent emergence of this educational tool, experienced educators are difficult to find. As such, individual centres have had to try and find a way to teach, train and mentor educators in the theories and practice of experiential learning, debriefing, crisis resource management, interprofessional education, as well as the design and running of simulation scenarios. The University of Calgary and the eSIM Calgary groups have organized a two day course designed to introduce participants to the concepts listed above, as well as to provide practical experience in the delivery of simulation-based education. The WISE Course (Workshop in Simulation Education) has been piloted on three groups over the past 12 months. Each course consists of up to 16 learners from various healthcare provider backgrounds, including medicine, nursing, respiratory therapy, among other health care professionals.

METHODS: Fifty-four participants from four pilot WISE courses were asked to complete retrospective pre-post workshop self-evaluation assessments asking them to rate their confidence in their abilities to perform several tasks related to the delivery of simulation-based education to health care providers both before and after the workshop. The assessment included 12 items pertaining to: simulation-related educational principles, suspending the disbelief of learners, debriefing groups following simulation exercises, principles of crisis resource management, designing a simulation scenario, and the basic use and functioning of various pieces of simulation equipment. The participants were asked to rate their confidence on a 5 point Leikert scale on whether they strongly disagreed (1), disagreed (2), were uncertain (3), agreed (4) or strongly agreed (5) with the various statements both before and after the workshops. The mean scores for each statement were calculated and any differences from the pre- to the post-assessment were tabulated. Statistical analysis was performed on the data using paired t-tests with an alpha of 0.05.

RESULTS: Statistically significant increases were seen between the pre- and postcourse self-assessment scores for all 12 confidence statements. The greatest increases were seen in the participants' confidence to: use the basic function of the various simulators (73.5–109.7% increase; $p_{0.01}$), to design, run and debrief a scenario for a group of learners (79.6% increase; $p_{0.01}$), define a debriefing plan for a simulation experience (70.2% increase; $p_{0.01}$), debrief groups following a simulation exercise (67.6% increase; $p_{0.01}$), design a simulation scenario (58.0% increase; $p_{0.01}$), and debrief principles of crisis resource management (52.3% increase; $p_{0.01}$).

DISCUSSION/CONCLUSIONS: Positive changes in the confidence of participants were seen in each of the statements asked of participants in a retrospective pre-post assessment for all of the areas covered in the WISE course pilot, including several areas critical to effective simulation-based education. This supports the use of the WISE course in its current format as an effective way of educating new simulation educators.

V.J. Grant, None.

Impact of Participation in Simulated Patient Resuscitations on Pediatric Residents' Confidence

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INTRODUCTION: Given the infrequency of in-hospital pediatric cardiorespiratory arrests, the knowledge, skills and confidence necessary for leading a successful resuscitation and stabilization of acutely ill or injured children must be taught through a structured curriculum designed to provide pediatric residents with the experiences they require, but are unlikely to obtain exclusively at the bedside. Currently, pediatric residents feel their knowledge and skills in pediatric resuscitation are insufficient, and lack confidence in their ability to manage pediatric cardiorespiratory arrests. This perception is supported by objective evidence of deficiencies in knowledge not only in pediatric residents, but also in practicing consultant pediatricians. New evidence suggests that a simulation-based curriculum might have a significant impact on confidence. The objective of this study was to formally assess the impact of participation in simulated pediatric cardiorespiratory arrests on pediatric resident confidence in elements of resuscitation.

METHODS: Pediatric residents at the University of Calgary participated in four different structured simulated resuscitations over the course of the study: one time as resuscitation team leader and three times as resuscitation team members. All residents completed questionnaires of baseline experience and training, as well as exposure to other sources of resuscitation learning over the study period. Confidence assessment questionnaires were completed by all residents pre and post simulated patient encounters. Residents were asked to record their confidence on a visual analog scale for 32 different aspects of resuscitation, including leadership and communication skills, technical skills, clinical skills, and specific resuscitation knowledge. Statistical analysis was performed using paired t-tests with an alpha of 0.05.

RESULTS: Statistically significant increases in confidence were measured across all aspects of resuscitation care: clinical skills (61.3 vs 73.4, 20% increase; $p_{0.001}$), technical skills (40.7 vs 63.0, 68% increase; $p_{0.001}$), knowledge (43.8 vs 63.5, 45% increase; $p_{0.001}$) and leadership (38.1 vs 65.0, 72% increase; $p_{0.001}$). Specific items that showed the most significant improvement in confidence were: confidence in the ability to perform defibrillation (172%), synchronized cardioversion (139%) and needle decompression (70%); confidence in the ability to manage pulseless arrest (56%) and wide complex tachycardia (55%); and confidence in the ability to establish self as leader of the code team (105%), retain control of the code team (86%), make definitive decisions during a resuscitation (76%), communicate clearly (70%), establish crowd control (66%), elicit feedback from team members (62%) and use team members effectively (62%). As a group, leadership skills showed the most significant improvement overall, with all 8 of the leadership items being in the top 10 items showing the most improvement in confidence after the simulation exercises. **DISCUSSION:** The most significant increases in confidence were found in items dealing with critical elements of resuscitation team leadership and elements needed to manage the most infrequent events in the pediatric population. Significant increases were also seen in the other domains of resuscitation: knowledge, technical skills and clinical skills. This supports using human patient simulation in improving confidence and self-efficacy in managing infrequent events and infrequently used skills among pediatric residents,

especially pertaining to leadership of resuscitation situations.

V.J. Grant, None.

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Education, competency, and assessment

Randomized Trial of Ultrasound Guidance for Placement of Subclavian Venous Catheter in Novice Practitioners

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OBJECTIVE: In 2001, the US Agency for Healthcare Research and Quality document “Making Healthcare Safer: A Critical Analysis of Patient Safety Practices,” recommended the use of real-time-ultrasound for placement of central venous catheters (CVCs) to prevent complications. In 2002, the National Center for Clinical Excellence in the United Kingdom made the same recommendation. However studies demonstrating effectiveness with ultrasound guidance (USG) for subclavian CVC have been less conclusive than for USG to access the internal jugular vein (IJ). The purpose of this study was to compare the use of ultrasound guided (USG) placement versus traditional anatomic placement without USG during subclavian central venous catheter insertion by novice practitioners using a simulation task trainer.

METHODS: A prospective randomized crossover cohort study of 42 4th year medical students was conducted during a single day of instruction with IRB approval in March 2009. Participants were offered an online instructional lecture and video prior to participation and were supervised with limited instructional guidance in a standardized manner during data collection. Participants were randomized to one of two study groups and each group served as its own crossover comparison. One group first attempted subclavian CVC placement using USG on a simulation task trainer, and then attempted subclavian CVC access without USG, using traditional anatomic landmarks. The second group began without USG then performed the task with USG. Data were analyzed using paired t test and Chi Square analysis where appropriate.

RESULTS: USG did not appear to provide a significant benefit the following parameters:

1) the number of attempts needed to successfully cannulate the vein; mean USG_1.6 advances (95% CI, 1.2 to 1.9), mean without USG_2.7 advances (95% CI, 2.0 to 3.3), $p=0.999$; **2)** time to successful cannulation in the USG groups from the start time of the needle touching skin; mean USG_70 sec (95% CI, 42 sec to 98 sec), mean without USG_108 sec (95% CI, 70 sec to 145 sec), $p=0.947$; or **3)** the proportion of students able to successfully cannulate the subclavian vein with USG_98% (95% CI 93%-100%) and without USG_98% (95% CI 93%-100%). The lack of significance of results persisted after controlling for group order and prior training of study participants.

CONCLUSIONS: The use of USG by novice practitioners in a controlled setting utilizing central venous access task trainers did not seem to improve time to successful cannulation, success rates or number of attempts needed to cannulate the subclavian vein. This is in contrast to policy recommendations encouraging the use of USG for the placement of CVC and in contrast to our previous work demonstrating that the use of USG during the insertion of internal jugular (IJ) CVC by novice practitioners is essential to improve patient safety during the procedure. Further study is needed to delineate why USG for cannulation of the subclavian vein has not proven to be as beneficial as for access to the internal jugular vein.

S. Griswold, None.

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Education, competency, and assessment

**Multi-center Development and Testing of a Simulation-based
Cardiopulmonary Assessment Curriculum for Advanced
Practice Nurses**

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Medicine, Miami, FL.

INTRODUCTION: Cardiopulmonary assessment skills are often limited among advanced
practice nurses and effective instructional methodologies, particularly to improve
auscultation skills, are needed. The goal of this project was to develop, implement,
and evaluate learning outcomes utilizing a simulation-based cardiopulmonary
assessment curriculum for advanced practice nurses in a multi-center research model.

METHODS: The study was carried out in collaboration with the University of Miami
Gordon Center for Research in Medical Education and was conducted at Florida International
University, Indiana University, Texas Tech University Health Sciences Center,
and University of Pittsburgh from January to June 2009. Following IRB approval,
educational interventions were incorporated into an existing graduate level advanced
practice nursing course and included faculty-led simulation-based case presentations
using Harvey®, the Cardiopulmonary Patient Simulator (CPS), and independent learning
sessions using the CPS and a multimedia computer-based CD-ROM program.

Outcome measures included a 31-item cognitive written exam, a 13-item skills performance
checklist used in a three-station OSCE, learner satisfaction and self-efficacy
survey, instructor satisfaction and self-efficacy survey, and a participant logbook to
record practice time using the self-learning materials.

RESULTS: Thirty-six advanced practice nursing students at the four institutions who
received the simulation-based training achieved statistically significant pre-to-posttest
improvement in cardiopulmonary assessment skills and cognitive knowledge (Table 1
and 2). Increased practice time was associated with increased self-efficacy of assessment
skills. The educational materials were highly rated by learners and instructors.

DISCUSSION/CONCLUSION: Educational interventions using simulation technology
that engage learners in deliberate practice of clinical skills produce significant
improvements and are highly rated by learners and instructors. Cognitive, skills, and
affective learning outcomes were high even with minor customization of curriculum
delivery across the four institutions. The multi-institutional collaboration was an effective
model for curriculum development and research evaluation.

J.A. Groom, Laerdal Medical, Speaking and Teaching, Honoraria.

Education, competency, and assessment

A New Approach to Pediatric Nursing Defibrillator Competencies with Mid-Fidelity Simulation

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INTRODUCTION: Life threatening arrhythmias require immediate and competent response to achieve a good outcome. Because such events are rare in children, it is a challenge to maintain and measure clinical competency in the use of the defibrillator in a pediatric institution. The optimal way to train staff in the use of the defibrillator is not known. Traditionally, nurses in our institution have been trained using didactic methods combined with demonstration on the defibrillator itself. We proposed that use of mid fidelity simulation would be a more effective method.

METHODS: In an IRB-exempt study, a convenience cohort of medical/surgical unit nurses were divided into two groups. One group (Traditional) were taught use of the defibrillator in a traditional fashion with a nurse educator reviewing use of the machine and observing the nurse perform the required steps. The other group (Simulation) was taught identical skills by a nurse educator running a scripted code scenario using a mid-fidelity simulator (Laerdal Mega Code Kid). We then retested each group 6 months later in one of two standardized scenarios on the simulator: ventricular fibrillation (VF), requiring them to defibrillate twice, or supraventricular tachycardia (SVT), requiring 2 cardioversions. In each scenario, time to first and second shock was recorded for each nurse.

RESULTS: Experience level between the Traditional and the Simulator group was comparable. In the VF scenario, requiring defibrillation, time to first shock was 70 sec for the Traditional group (n=10) vs 53 sec for the Simulation group (n=10), time to second shock was 57 sec for Traditional vs 41 sec for Simulation, and total time was 127 sec for Traditional vs 93 sec for Simulation (p = NS for all). For the SVT scenario, requiring cardioversion, time to first shock was 94 sec for Traditional (n = 6) vs 72 sec for Simulator (n=6, p=NS), time to second shock was 71 sec for Traditional vs 40 sec for Simulator (p = 0.03), and total time was 166 sec for Traditional vs 112 sec for Simulation (p = 0.002).

DISCUSSION: Nurses taught use of the defibrillator using simulation tended to deliver shocks faster than those taught using traditional methods, although with 10 nurses per group only the second shock and the total time in the SVT scenario reached statistical significance. The difference between groups was of a magnitude that would be expected to be clinically significant and potentially life-saving. Whether the simulator engendered better learning, understanding or retention than the traditional method cannot be determined from these data. Although further study is required, these preliminary results suggest that teaching pediatric medical/surgical nurses to use the defibrillator with simulation is superior to traditional, didactic methods.

M. Halligan, None.

Education, competency, and assessment

Cardiovascular Critical Care Nurse Orientation: A Sentinel Event-Based, Collaborative Curriculum Using High-Fidelity Simulation

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INTRODUCTION: High-fidelity simulation provides the opportunity to reproduce clinical events and train healthcare professionals in an educational environment that is safe, controlled, and realistic. The use of simulated clinical scenarios of actual sentinel events adds a unique, quality-based approach to education. Critical care nurse educators at the East Carolina Heart Institute in collaboration with the Brody School of Medicine Medical Simulation and Patient Safety Program, incorporated high-fidelity simulation sessions based on actual sentinel events into a new hires critical care nurse orientation program. The goal of this ongoing project is to successfully incorporate these events into nurse orientation, initiate nurse-physician interaction and collaboration, and to assess the quality and effectiveness of the educational experience.

METHODS: High-fidelity simulation sessions were incorporated into the new hires critical care nurse curriculum in July 2008. Through the process of clinical case review project faculty identified six clinical cases involving sentinel events. A new hires orientation program expanded over twenty weeks using two of six actual clinical case studies involving sentinel events. A METI ECS high-fidelity simulator was used to replicate actual clinical scenarios involving these events. Sixty-five new hires and twenty-five clinical coaches participated in this program. Each simulation session was video recorded and clinical nurse educators and emergency medicine physician simulation faculty conducted immediate debriefing with each group. New hires alone participated in the first session. Clinical coaches participated in subsequent sessions along with their respective group of new hires. New hires and coaches individually assessed the educational experience using a five point Likert scale survey. Coaches subjectively assessed the effect of simulation-based training on the clinical performance of new hires upon completion of the first simulation-based session.

RESULTS: Ninety-nine percent of the new hires responded “very good to excellent” that they gained useful clinical experience, and that their critical thinking skills were enhanced by the experience. Clinical coaches responded that they noted consistent improvement in the new hires’ clinical assessment skills and clinical knowledge. Five critical patient care-related events resulting in decreased patient morbidity or mortality have been detected by these new hires since their participation in the simulation-based orientation process.

DISCUSSION/CONCLUSIONS: A safe, realistic clinical training environment can be provided by integrating high-fidelity simulation into a new hires critical care nurse orientation curriculum. The use of case scenarios based on actual sentinel events provides an effective quality-based educational approach. Nurse-physician collaboration appears to be beneficial to the new hires orientation experience. Our experience indicates the potential for improving patient outcomes using this reality-based educational format.

B.C. Harris, None.

055

Education, competency, and assessment

Factors Compromising Safety: Stressful Events in the Operating Theatre

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INTRODUCTION: Surgeons regularly face a number of stressors in the Operating Room (OR). Despite the potential of stress to compromise patient safety, objective evidence detailing the extent and/or causes of stressful events in the OR is lacking. Research that has investigated surgeons' stress has typically been conducted in laboratory settings which may not be realistic and generalisable to real ORs. The aims of the research reported were to identify multiple factors causing stress in the OR, their relative incidence and the level of stress they cause.

METHODS: Stressful incidents in the OR were recorded by an observer in 55 surgical procedures in the domains of General and Orthopaedic Surgery within a large teaching hospital. During each case, the observer recorded activities and events that occurred in real time using standard ethnographic field note techniques. Recorded observations included occurrences such as communications between the surgeon and other team members, entrance and exits of individuals, operative events and distractions such as background noise. Field notes were coded independently by two researchers to identify stressors, using a pre-determined framework based upon previous research conducted by our group. Surgeons rated how stressful each incident was and how much stress they experienced (validated State Trait Anxiety Inventory).

RESULTS: Significant and sizeable positive correlations ($r_s=0.6$, $p_s<0.01$) were obtained between the two coders for all stressors, indicating good reliability in the coding. Total count of stressors/case ranged from 1–23.5 (mean 5.87). These findings provide evidence that surgeons regularly face a number of stressors in the OR. The most frequent type of stressor identified was distractions/interruptions and the least frequent type of stressor identified was teaching. Technical, patient and equipment problems occurred frequently and were perceived as most stressful. Frequent, but less severe, stressors were distractions/interruptions. Team-working problems were the least frequent/most severe stressor. Self-reported stress scores confirmed that at times surgeons experience extremely high levels of stress within the OR; the highest STAI Intra-operative score was 23 (minimum 6 maximum 24).

CONCLUSIONS: The results confirm that surgeons face an array of stressors in the OR. Examination of high-frequency/low-severity stressors, and low-frequency/high-severity stressors indicates that stress experienced is not only a function of the number of factors present but also a function of the likelihood of the factor in eliciting stress. A clear understanding of the frequency and severity of stressors is vital in structuring training strategies and direct resources to factors that are frequent and highly stressful. We propose that Simulation-based training would be an ideal environment to provide Surgeons with the experience of encountering the range of stressors that they are faced with in the OR. Simulation would provide a safe, realistic arena to train stress management thus potentially improving the quality and safety of patient care.

L.M. Hull, None.

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Education, competency, and assessment

Evaluation of a Three Hour Multi Professional Emergency

Team Training Session: Was the Training Worth the Time

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INTRODUCTION: Emergency care is often performed under time pressure with a high amount of information from different sources. When things go wrong in emergency situations it is often attributed to failed communication together with a lack of leadership and followership in the team. To address these errors we designed a three hour CRM course with focus on good teamwork, communication, leadership, coordination, trust and support. A course evaluation form was used to analyze how the participants graded the course. The aim of the present study was to evaluate how doctors and nurses perceived their participation in a three hour mannequin-based team-training session.

METHODS: Nineteen instructors (10 nurses and 9 doctors) went through a three day instructor course with mixed practical and theoretical sessions on CRM, debriefing skills and running a mannequin (SimMan, Laerdal Corporation). After the instructor training course, the new instructors were able to run a three hour scenario-based CRM course. The training session started with 30 min introduction to CRM principles (leadership, followership, communication skills, call for help), a brief introduction to the emergency room mock-up and the patient simulator, 15 min scenario, one hour video facilitated debriefing and group discussion about lessons learned, 15 min application of lessons learnt on a new scenario and then a brief summary. Doctors, nurses, and assistant nurses (n=396) that work in operating theatres, intensive care units, recovery wards and emergency wards in two hospitals in Northern Sweden were included in the study. Data was collected collection 2008–2009. A 7-point Likert scale was used in the survey (1=strongly disagree/dislike, 7=strongly agree/like) and the participants also described in text their opinion of the course. The protocol was approved by the Regional Ethical Review Board.

RESULTS: Both doctors (n=71), nurses (n=186) and the nurse assistants (n=139) had a very high overall impression of the three hour CRM-based team training (Doctors 6.41_{±0.55} vs. nurses 6.67_{±0.56} vs. nurse assistants 6.73_{±0.43}, p=0.001). It was well worth the time spent at the course (Doctors 6.67_{±0.58} vs. nurses 6.88_{±0.37} vs. nurse assistants 6.91_{±0.28}, p=0.001). The course curriculum was considered very useful in clinical work (Doctors 6.61_{±0.64} vs. nurses 6.76_{±0.59} vs. nurse assistants 6.80_{±0.49}, p=0.05). More frequent team training is a very frequent request from the participants.

DISCUSSION/CONCLUSIONS: Our conclusion is that a three hour team training session creates positive reactions among participants. We believe that it is important to let doctors and nurses who normally work together also train together in team. Training should be a natural and regular part in the organization. By educating instructors from the different wards at a hospital you can easily distribute the training to different units at your hospital.

M. Hultin, None.

057

Education, competency, and assessment

Developing Mastery of Suturing and Knot-Tying in the Early Hospital-Based Training Years

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INTRODUCTION: Simulation training has shown to improve basic surgical skills but the creation of a curriculum that develops mastery among all early hospital-based

trainees (MS3-PGY1) has not been established. This study assesses need, develops and tests a formal simulation-based suturing and knot-tying curriculum that facilitates obtainment of such mastery.

METHODS: All subjects (n_53) performed simple-interrupted sutures with 3 square-knots using instrument-tie and 2-hand techniques. Curriculum trained subjects (n_14) were shown a 10-min voice and text-annotated instructional video combined with a one hour 1:2 ratio (instructor:learner) concurrent feedback training session. Subjects were given the expert-derived mastery checklist, on-demand online video, and were allowed unlimited swipe-card access for self-practice for 2-months. Final performance was recorded and assessed with the mastery checklist (14-parameters for suturing and 9-parameters for knot-tying). Performance was compared to historic controls that represent traditional early hospital-based training (n_39, MS3-PGY1, sampled April-June) by a chi-squared test.

RESULTS: Average self-practice time was 3-hours, range 0–4, including on-average one-hour of video review. Mastery among traditionally trained early hospital-based subjects was 23% (17%MS3, 33%MS4, 50%PGY_1). Mastery among curriculum trained subjects was 93% (IRR_0.8, p_.01). Results for each skill type (see Fig_1).

DISCUSSION/CONCLUSIONS: Mastery is not generally obtained during traditional early hospital-based training. 2-hand knot-tying was the limiting-factor to combined mastery in both groups, but curriculum trained subjects mastered the technique almost uniformly. Suturing deficiency, though less prevalent, was seen across a majority of traditional trainees and was uniformly mastered after curriculum training. Therefore, we found that a well structured, self-directed, simulation-based curriculum assures obtainment of mastery for both skills among trained subjects, with limited instructor involvement and trainee time. Such a curriculum could be extended to all early hospital-based trainees, including rising and active interns. This method may augment trainees' O.R. experience, promote surgical confidence and improve patient care without impacting the 80-hr work week.

P.A. Ikemire, None.

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Education, competency, and assessment

Errors Training in Advanced Cardiac Life Support (ACLS): A Psychophysical Approach

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INTRODUCTION: While conventional simulation training focuses on teaching procedural details and best practices, the training can be significantly improved by integrating errors training that exposes students to different types of errors and further elucidates methodologies to avoid adverse events.

METHODS: Our study focused on Advanced Cardiac Life Support training. We utilized ACLS training experts who identified that diagnosis stage of the ACLS contained maximum errors. To identify the errors that may occur in diagnosis we employed a multidimensional scaling approach, where subjects were provided with a pair of stimuli and asked to rate the similarity between them. A similarity matrix was populated and then scaled to lower dimensions using numerical optimization. The lower dimensional space revealed the basis on which subjects analyzed the similarity between the stimuli and suggests the conceptual organization of information in subjects. We provided expert nurses and novice nurse trainees with pairs of 12 lead EKG rhythms commonly used in ACLS training and asked them to rate their similarity on a scale of

one through nine. When grouped according to expertise and scaled to 2 dimensions, it was revealed that expert nurses analyzed the similarity of rhythms based on how they represented patient status, while nurse trainees' conceptual space pointed to similarity organized based on visual similarity of wave forms to each other. We identified the pairs of wave forms that had high ratings of visual similarity (and hence high chance of confusion during actual procedure) as identified by novices and devised a training procedure that would emphasize the difference between the waveforms. The training also included simulation modules where trainees were shown the impact that errors in diagnosis between two waveforms would produce. Three groups of nurse trainees participated in the study (n_30 in each group). Control group was exposed to conventional ACLS training, the first experimental group was exposed to ACLS training augmented with errors training with low end simulation using low fidelity airway and defibrillation capabilities and the second experimental group was exposed to ACLS training augmented with errors training with high end simulation using high fidelity patient simulators. Each group was provided an initial didactic module after which they performed a pretest on diagnostic proficiency. A post-test was performed after completion of the training. The results of the post-test were compared against benchmark results from experts who performed the same post-test.

RESULTS. The results showed a 0.19, 0.18, 0.17 correlation between the experts score and control group, experimental group I and experimental group II in the pretest. None of these correlations were significant. After the completion of training, the control group showed a correlation of 0.387 with experts (not significant $p_{0.3}$) while the experimental group I and experimental group II showed significant correlation ($p_{0.03}$) of 0.68 and 0.79 with the experts' scores.

Discussions: We employed a psychophysical methodology to identify common diagnostic errors in ACLS procedure. An errors training module was developed to augment conventional ACLS training and the results showed the validity of including this module in training.

REFERENCES

K. KAHOL, NONE.

059

Education, competency, and assessment

Weighted Checklists: A Novel Methodology For Evaluation Of Students In Simulation Environments

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INTRODUCTION: Conventional checklists have been employed in simulation as a readily available means to evaluate students. However checklists often can be too lengthy and may not serve as an adequate means to evaluate a student's expertise in a procedure. We argue that experts are often not adept at remembering complete procedures but actually have an inherent weighting scheme for different steps of a procedure. Based on this weighting scheme, experts can accomplish success in procedures. We also argue that novices lack such an inherent weighting scheme and often focus on procedural details thereby compromising overall proficiency and often patient safety. We developed a methodology to prove this hypothesis and developed a measurement tool called weighted checklists that offer a better means of evaluating students in simulation environments and providing feedback to students.

METHODS: We observed attending physicians (n_10) as well as residents (n_15) completing advanced cardiac life support training (ACLS) and evaluation. Standardized

checklists for ACLS training were employed for the evaluation. Prior to the evaluation an independent board of experts weighted each step of the ACLS checklist according to criticality of the step in ensuring clinical proficiency. The performance of both groups of participants was noted on the weighted checklists.

RESULTS: Eight of the fifteen residents were able to complete the ACLS evaluation scenario with favorable results. All the attending physicians completed the evaluation scenario with favorable results. In the weighted checklists it was seen that all attending physicians did not complete all the steps in the procedure but achieved all the top five highly weighted steps. On the other hand, only two residents were able to complete the entire checklist (both of them achieving favorable results), while the other six who had favorable results achieved 90% adherence to the top five highly weighted steps and only 70% adherence to the low weighted steps. The remaining seven residents with unfavorable results had only 30% adherence to the highly weighted steps.

DISCUSSION/CONCLUSIONS: The results above showed that weighted checklists are a better representation of expertise and are hence more suited for evaluation. Based on these results, we developed weighted checklists as a means of evaluating students and providing feedback. The weights assigned to different steps direct the instructors to focus on important parts of a procedure. This allows for precise focus during training while actually providing an additional level of feedback to the students on their performance. The score of the student on conventional checklist is the sum total of steps performed accurately. This score does not account for criticality of steps the student may have missed. On the other hand, the score of students on weighted checklists is the weighted sum of the steps performed accurately by the student. The weighted sum represents criticality of steps students may have missed during training and results in a better scoring mechanism. The weighted checklist also enables students to develop inherent weighting scheme and understand the true nature of various procedures.

REFERENCES (Optional):

K. Kahol, None.

060

Education, competency, and assessment

Simulation Training During Medical School for Common Pediatric Procedures: a Multi-Center Descriptive Study

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INTRODUCTION: Pediatric interns are expected to perform procedures on patients when they begin residency, however it is difficult to guarantee that all trainees are competent in these procedures before they have patient contact. Simulation is an increasingly

popular tool utilized in many medical schools to increase experience with common procedures without risking harm to patients.

METHODS: Anonymous questionnaires were administered online to 167 interns at ten separate pediatric training programs across the United States asking about training experiences during medical school.

RESULTS: Surveys were completed by 167 pediatric interns at 10 different teaching hospitals. Lumbar Puncture (LP): Ninety percent of interns disagreed with the statement that they feel confident in their ability to perform an LP on an infant. Fifty-seven interns (34%) never observed an infant LP. Thirty-three interns (20%) received didactic infant LP training, and seventeen interns (10%) received simulation-based infant LP training. Interns who had experience performing an LP on a simulator were over two times more likely to have attempted an LP on a real patient (35% vs 17% $p = .07$) in medical school. Overall, thirty-two interns (19%) attempted an infant LP on a patient during medical school with 59% stating their most recent attempt was successful. There was no difference in reported success with last infant LP between those who did or did not have a simulation experience in medical school (57% vs 43%, $p = .398$). Intravenous Catheterization (IV): Sixty-nine percent of interns surveyed disagreed with the statement that they feel confident in their ability to place an IV in a child (age 1 to 18). Seven interns (3%) never observed an IV being placed in a child. Ninety-five interns (57%) reported receiving didactic IV training in medical school, and eighty-five interns (51%) received simulation-based IV training. Interns who had experience performing an IV on a simulator were just as likely to have attempted an IV on a real patient as those without simulator training (54% vs 46%, $p = .538$). Ninety interns (54%) performed an IV on a child during medical school with 88% reporting their most recent IV attempt was successful. There was no difference in reported success with last IV between people who did or did not have a simulation experience in medical school (88% vs 88%, $p = .599$).

DISCUSSION/CONCLUSIONS: Very few pediatric interns have had an opportunity to practice procedures on a simulator before they are expected to perform them on real patients during residency. Self-reported confidence and experience with performing infant LPs and placing IVs in children is low. Those who have infant LP simulator training may be more likely to attempt an LP on a real infant during medical school. This descriptive data comes from an ongoing multi-site randomized trial to study the effect of procedural simulation training on patient outcomes.

D.O. Kessler, None.

061

Education, competency, and assessment

Design of Simulation Scenarios for Obstetrical Nursing

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INTRODUCTION: Despite medical advances, human error comprises more than half of medical errors, and respective medicolegal consequences became of paramount importance in healthcare. As an effort to alleviate human errors, high-fidelity simulation-based training is gaining popularity in medical institutions. In particular, simulations for obstetrical nursing can prepare nursing students for patients with diverse chronic diseases and unexpected complications that are infrequent in clinical training. Nonetheless, development and evaluation of simulation scenarios are not well studied. A simulation scenario defines clinical events to be simulated and determines the sequence of events according to trainee's reaction. To be effective, the simulation scenario

should expose trainees to comprehensive situations they may encounter in clinics. The scenario also needs to provide educational tools to promote the learning progress. In this regard, this study develops high-fidelity simulation scenarios for obstetrical nursing with the following goals; (i) the scenario demonstrates clinical situations encompassing prenatal, labor and delivery, and postpartum phases; and (ii) the scenario prescribes training goals of simulated events so that learning progress can be evaluated and the weakness of the trainee can be compensated in subsequent training.

METHODS: We developed three simulation scenarios for prenatal (scenario_1), labor and delivery (scenario_2), and postpartum (scenario_3) phase. Scenarios describe frequent clinical events during respective phases. Each scenario defines ten nursing actions to be performed in response to the events. These actions demonstrate trainees' knowledge and techniques (Leopold's maneuver, fetal heart-rate and labor pain monitor, breathing techniques, and oxygen therapy) and inter-personal skills (interpretation of patient responses, patient-privacy, emotional support, and communication with patients). Nursing students were trained in groups by the three scenarios using NOELLE (575) simulator. Each student was evaluated by one scenario chosen at random while the trainer recorded performed actions and their adequacy. The program ends with a debriefing session. Before and after the course, trainees were surveyed for their self-confidence.

RESULTS: 138 second-year nursing students attended the program. Mean score of self-confidence significantly increased after the program: (scenario_1) 62.5 to 72.4, (scenario_2) 60.4 to 66.8, and (scenario_3) 59.3 to 72.1 (all $p < 0.01$). Mean adequacy score (portion of adequate actions among all performed actions) was higher than mean action score (portion of performed actions among all expected actions); (scenario_1) 9.58 vs. 7.88, (scenario_2) 7.92 vs. 5.06, and (scenario_3) 9.91 vs. 7.86 (all $p < 0.01$). The program identified the strength and weakness of the trainees. In scenario_2, for instance, students excelled in psychological nursing, say easing anxiety, while they failed the most in protecting patient privacy. Students answered that the simulation training would improve their nursing practice for obstetrical patients in the future (mean 8.01, SD 1.907).

DISCUSSION/CONCLUSIONS: Well-design simulation scenarios can improve nurse education and diminish adverse events for obstetrical patients. We designed obstetrical simulation scenarios that prepare students for situations in all perinatal phases and evaluate their learning progress in detail. Our results show that the designed scenarios are effectual for promoting self-confidence of nursing students and improving the quality of obstetrical nursing education.

M. Kim, None.

062

Education, competency, and assessment

Comparison of Simulation-Based ACLS Versus Traditional ACLS Curriculum in Third-year Medical Students

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INTRODUCTION: High-Fidelity simulation-based training is an effective educational tool that has been utilized in medical resident ACLS training, but little is known about implementing ACLS simulation training for medical students.

METHODS: We compared the performance of third-year medical students in a traditional 2 day ACLS course to that of medical students in a modified longitudinal simulation-based ACLS curriculum during their emergency medicine rotation. The

traditional course included: didactic lectures, AHA-approved videos, small group sessions, and a classroom written exam. Partial task trainers were used to provide instruction in ACLS according to AHA guidelines. Students in the modified curriculum independently watched the AHA-approved videos/slides and completed the examination online. These students also participated in two separate 4 hour simulation sessions using Laerdal Sim-Man™ High-Fidelity mannequins for deliberate practice of acute stroke, Acute Coronary Syndrome (ACS), and ACLS-based rhythm cases. Student end of course performance in both groups was measured with a pre-programmed, scripted mega-code. Students were individually tested, with assistants present to perform resuscitation tasks as directed by the student. Mega-codes were videotaped and each action was timed using the Laerdal computer software. Students completed a survey at the completion of the mega-code.

RESULTS: For continuous variables, Student's t-test was used when the samples had equal variances, otherwise the Welch-test [t(d)] was applied. Chi Square (χ^2) was used for categorical data. All data were analyzed using MedCalc v 9.5.1.0. Data for 22 students from the traditional group and 13 students from the modified longitudinal group were available for analysis. Some student videos were unavailable due to technical issues. There was no difference in performance scores based on the videos between the two groups [t(d) 1.15, p 0.26, 95%CI for difference 1.25 to 4.38]. No significant differences were found for Time to Initiate CPR [t 1.3, p 0.20, 95%CI 6.53 to 29.6]; Time to Initiate Shock [t 1.91, p .06, 95%CI 1.69 to 53.4]; student's comfort in running the mega-code [t 1.61, p .11, 95%CI 0.23 to 1.94]; or how prepared students felt in running a real code [t(d) 1.65, p .12, 95%CI 2.63 to 2.14]. There were significant differences in perceptions of how well the curriculum prepared them for the mega-code, with the modified curriculum group reporting higher average ratings [t 3.79, p .0006, 95%CI .65 to 2.11] and greater time spent in preparation outside scheduled course time [2 15.17, p .001].

DISCUSSION/CONCLUSIONS: Using High-Fidelity simulation, students demonstrated equal proficiency in running a mega-code compared to a traditional curriculum. The modified longitudinal ACLS curriculum was shown to be just as effective as a traditional approach, with increased independent learning and reduced classroom time. The modified group felt the simulation-based curriculum better prepared them for the mega-code compared to the traditional group. Future studies should target additional ways of using simulation in improving ACLS training for medical students. Study approved by the Institutional IRB for exemption.

P.Y. Ko, None.

063

Education, competency, and assessment

Teaching Medical Students By Medical Students: Development And Evaluation Of A Medical Emergency Training Programme Provided By Specially Trained Student Tutors Using An Hightech Patient Simulator

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INTRODUCTION: Simulation courses have become quite popular. Nevertheless, the number of hands-on simulation courses offered for medical students is still not sufficient in Germany. The reason is mostly lack of personnel. To overcome this deficit we designed this student-student teacher programme.

METHODS: We developed an interdisciplinary course for the specific preparation of students for common hospital emergencies with realistic state-of-the-art patient simulator (SimMan, SimMan 3G, Laerdal, Norway). The aim of the course was focused on symptom oriented thinking and differential diagnostic considerations as well as training the practical skills by recognizing and treating of the actual disease under realistic team conditions (problem-based learning). The evaluation was designed to assess the subjective improvement of the student's competencies concerning the treatment of medical emergencies. Consisting of five modules, the course was dedicated to specific every day chief complaints (chest pain, dyspnoe, loss of consciousness) as well as basic training in paediatric emergency situations. The first module was designed as a refresher of the practical skills. The course was held by 5th year student tutors who acted as instructors and received a special training including an instructor course. They also designed the course and developed the scenarios themselves, supervised by a senior physician and simulation instructor. The participating students (4th year students) received a pre-post questionnaire to assess their subjective practical competence (1–6 scale, 6 being best) with each of the chief complaints. The questionnaires of 25 participating students from different courses were chosen as a random sample. The skillsmodule as well as the paediatric-emergency module were excluded from evaluation as we applied different settings throughout each course, respectively. Statistical analysis was conducted using student's t-test with Bonferroni correction.

RESULTS: All students improved significantly in all three “chief-complaint”-modules. The practical competencies of the students in treating the major differential diagnoses of each chief complaint improved significantly as followed. In module “chest pain” the mean difference pre-post course was 1,5_ 0,299 SD; CI (0,877; 2,12), p_.0001, in module, dyspnoe“ the mean difference pre-post course was 1,84_ 0,309 SD; CI (1,20; 2,478), p_.0001, and in module, loss of consciousness“ the mean difference pre-post course was 1,58_ 0,254 SD; CI (1,06; 2,11), p_.0001. The evaluation of the basic training of the students on CRM principles showed a significant improvement of the student's abilities and understanding ofCRM in 5 of 6 questions, p-values ranging from p_.0001 to p_.0043. Additionally, all participants declared to have benefited for future patient treatment. The tutors as well as the course received high global ratings (mean 5,68 on a scale of 1–6, 6 being best, overall mark for the course: A-) and very positive anonymous individual feedback from participants.

DISCUSSION/CONCLUSIONS: This study demonstrates that peer teaching in undergraduate simulation training is feasible, widely accepted among tutees and leads to a significant improvement in the student's theoretical and practical competencies, provided that the tutors receive sufficient training and supervision. The specific training is a valuable part of the curriculum of medical students and should be adopted.

B.J. Kober, None.

064

Education, competency, and assessment

Teaching Neonatal Resuscitation To Emergency Medicine

Residents: Does A Simulation-Enhanced Intervention Improve Knowledge And Skills

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Title:

Teaching neonatal resuscitation to emergency medicine residents: Does a simulation-enhanced

intervention improve knowledge and skills

INTRODUCTION: In 2000, the Society of Academic Emergency Medicine Pediatric Education Training Task Force conducted a survey of emergency medicine [EM] residency program directors and highlighted the need for further education in neonatal resuscitation [NR]. No previous studies have been conducted to evaluate emergency medicine residents' knowledge of neonatal resuscitation. **Objective:** To determine if simulation-enhanced NR training is more effective in teaching EM residents about NR than the standard EM curriculum at Rhode Island Hospital.

METHODS: We conducted a prospective randomized study to assess second, third, and fourth year emergency medicine residents' NR knowledge and skills. Residents were block randomized based on their level of training. The intervention group had 12 participants and the control group had 15 participants. To assess baseline knowledge, each participant was required to manage and lead a simulated NR using a high fidelity neonatal simulator. One month after the initial assessment, the intervention group participated in a 4 hours of simulation-enhanced educational session, which included didactics, skill stations, and multiple simulations with expert debriefing. Both groups continued with the standard EM curriculum with monthly simulation sessions on a variety of topics including pediatric EM. Three months after the intervention, all participants were again individually assessed using a simulated NR case. All assessments were digitally recorded and reviewed by two Neonatal Resuscitation Program [NRP] instructors. The reviewers were blinded to the intervention and had never met the participants. They were trained to evaluate each resident using a previously validated neonatal scoring tool based on NRP guidelines, which gives a numerical score from 0–100%. Prior to each assessment, participants completed a survey regarding their experience with NR. After the study was completed, the control group was offered the simulation-enhanced educational intervention.

RESULTS: Demographics, including gender, level of training, and number of obstetrical deliveries were equally distributed between the control and intervention groups. The mean initial assessment score of the control group was 61% and intervention group 58%. The mean final assessment score of the control group was 61% and intervention group 70%. There was no significant change in the control group, but the intervention group improved by 12%, (p value ≤ 0.03). The majority of all residents (75–80%) reported feeling “not at all confident” during the initial assessment. The majority of the control group (67%) still reported feeling “not at all confident” in the second assessment. Conversely, the majority of the intervention group (58%) reported an increased level of confidence after the intervention.

DISCUSSION/CONCLUSION: Our simulation-enhanced educational intervention significantly improved the emergency medicine residents' knowledge of and performance in neonatal resuscitation. The residents in the intervention group also reported improved confidence levels with NR. Although the intervention was a single 4-hour session, it is encouraging that the residents demonstrated increased knowledge and improved skills 3 months later. As a result of this study, simulation-enhanced neonatal resuscitation will be incorporated as part of the standard EM resident curriculum at our institution.

M. Lee, None.

065

Education, competency, and assessment

High-Fidelity Ultrasound Simulation Facilitates Teaching the FAST Scan Technique to Emergency Medicine Residents

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INTRODUCTION: Rapid performance of the FAST ultrasound scan is an important adjunct in the care of abdominal trauma patients, but is difficult to teach in the emergency room due to patient acuity. We undertook this study to evaluate the value of a high-fidelity ultrasound scan simulator in teaching the FAST technique to emergency medicine residents.

METHODS: Twelve emergency medicine residents were given a survey at the start of the program to assess their current level, using a 5-point Likert scale (1_low, 3_average, 5_high). After a curriculum-driven program including known and unknown cases, residents were surveyed again. Data were evaluated with the paired Student's T-test. IRB review was not applicable.

RESULTS: On the pre-program survey, 4 of 12 (33%) had never performed the FAST scan on a patient. Zero of 12 (0%) had seen abnormal FAST scan images. Residents were indecisive (3.0_0.60, mean_SD) about their ability to identify abnormal findings, and somewhat unsure of their ability to confidently perform the scan (2.4_0.7). Following the program, residents had a modest but significant increase in their perceived ability to perform the scan (3.25_0.6, p_.05) and their self-evaluation of confidence level (3.08_0.9, p_.05). Further, residents showed above average satisfaction (3.4_0.8) with the course, and were likely to recommend it to colleagues (3.42_0.8). Residents were satisfied that the course improved both knowledge (3.75_0.6) and technical abilities (3.4_0.8).

DISCUSSION/CONCLUSIONS: These data demonstrate that a simulator-based course can significantly increase residents' confidence and self-perceived ability to recognize abnormal images on a FAST scan of the abdomen, a critical skill for emergency medicine residents. A high-fidelity simulator has a role in teaching this important skill. Future research will evaluate optimal course design and the potential value of repetitive sessions.

A. Lefor, None.

066

Education, competency, and assessment

Ex-vivo Tissue Simulation Improves Student and Resident Surgical Training

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INTRODUCTION: Students and residents learn surgical skills in a number of environments, but the optimal role of each is not yet defined. Trainees should have a certain level of skill prior to animal laboratory experience. This study was undertaken to examine the possible benefits of ex-vivo tissue as a simulation tool.

METHODS: IRB review was not applicable. Animal ethics committee approval was obtained prior to starting this work. Ex-vivo animal tissue was obtained from animals used for other purposes. *Students:* In two separate years, senior medical students (N_56) received a series of lectures and dry lab training in gastrointestinal anastomoses.

Students were randomized into a dry lab only (DL, N_29) group and a group that also used ex-vivo tissue (EXV, N_27). Both groups then performed animal surgery. Performance was measured by global scores and task scores evaluated by two faculty raters as well as self-assessment. *Residents*: Surgery residents (N_5) underwent training with ex-vivo tissue for gastrointestinal and vascular surgery followed by an animal laboratory and a self-assessment tool.

RESULTS: *Students*: Task scores were similar for both groups (DL 95.7_17.5, EXV 92.5_21.0, p_.05) as well as global rating scores (DL 31.3_5.6, EXV 30.4_6.8, p_.05). EXV students judged dry lab training as significantly less useful (p_.05) than DL students. EXV students felt significantly more confident (p_.05) than DL students to perform the animal laboratory. *Residents*: Of the 5 residents, 0/5 (0%) had performed gastrointestinal or vascular surgery on patients. All 5 residents (100%) felt that the EXV training was a valuable experience prior to animal surgery.

DISCUSSION/CONCLUSIONS: These data demonstrate that ex-vivo tissue provides a valuable way to practice surgical skills at both student and resident levels and helps respect the 3R principle of animal ethics. Animal laboratories remain an important method of teaching certain surgical skills. Future research will further define the optimal role of ex-vivo tissue simulation in the surgical curriculum.

A. Lefor, None.

067

Education, competency, and assessment

Standardized Invasive Bedside Procedural Training Improves Self-Assessed Confidence and Competence

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INTRODUCTION: Simulation-based instruction of invasive bedside procedures has become an integral part of residency training¹. Residents may be reluctant to perform these due to a lack of confidence and competence; therefore, we created a comprehensive curriculum, including deliberate practice, for mastery of procedural performance and the development of confidence and competence.

METHODS: Second and third year internal medicine residents participated on a rotation, during which they learned four invasive bedside procedures using a task trainer (lumbar puncture, thoracentesis, paracentesis, central venous catheter insertion) and training in the use of ultrasound guidance. They were then assigned to the hospital's dedicated procedure service. All procedures performed on patients were supervised by the attending physician. From July 2007 through December 2008, 68 residents rotated on the service and were asked to assess their confidence and competence through a pre-intervention written survey using a five point Likert scale (1 - not at all, 5 - completely). Of those, 40 (59%) also completed the post-rotation evaluation.

RESULTS: More than 750 procedures were attempted, on hospitalized patients, by the 40 who completed both the pre and post-intervention survey. 90% of those attempted were successfully completed. On the pre-intervention survey, 23% of residents reported a confidence level of 4, and 28% reported a 5. Post-intervention, 12.5% reported a confidence level of 4, and 87.5% reported a 5. On the pre-intervention survey, 21% of residents reported a competence level of 4, and 26% reported a 5. Post-intervention, 7.5% reported a competence level of 4, and 92.5% reported a 5.

DISCUSSION/CONCLUSIONS: Traditionally, procedural skills have been learned through the "see one, do one, teach one" method. Our study demonstrates an

improvement in self-reported confidence and competence after having participated in a standardized, simulation-based curriculum. Physicians who perform invasive bedside procedures should undergo formal instruction, including deliberate practice, to achieve mastery learning and improved confidence and competence.

REFERENCES (Optional):

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J.D. Lenchus, None.

068

Education, competency, and assessment

Expert Modeling Improves The Retention Of Technical Skills In Neonatal Resuscitation Training

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TX.

INTRODUCTION: Data suggests that standardized training in neonatal resuscitation favorably impacts neonatal outcome. For this reason it is important to know how well practitioners adhere to the NRP guidelines during actual resuscitations. Carbine, Finer, Nodel, and Rich (2000) analyzed video footage from 100 newborn resuscitations to evaluate compliance with the NRP guidelines in their institution. Although all members of the resuscitation teams were NRP certified, 54% of the resuscitations had visible deviations from the guidelines, including poor suctioning technique, incorrect use of oxygen, poor bag mask ventilation technique, and inadequate reevaluation. Evidence from studies evaluating skill retention suggests these deviations may, in part, result from skill degradation. Currently, NRP providers are required to recertify their provider status every two years. Kaczorowski, Levitt, and Hammond (1998) studied skill degradation in trainees undergoing NRP training and documented a significant decline in both cognitive knowledge and technical skills after six months. There are similar reports from the resuscitation literature citing significant degradation of learned resuscitation skills, some degrade as early as two weeks after initial training.(Moser, 1992; Su, 2000; Smith, 2008). Current literature on medical expertise suggests that modeling may facilitate the acquisition of expert technical skill sets. During observation, learners selectively take in information about performing; from these observations a mental image is created that provides a cognitive reference for the learner. Obtaining an accurate (expert) cognitive depiction is necessary for technical skill proficiency. Previously we reported an improvement in technical skill acquisition when novices underwent expert modeling compared to learner modeling. We retested these subjects 6 months after initial training to investigate how expert modeling impacts retention of technical skills.

METHODS: 31 subjects underwent simulation-based neonatal resuscitation training; they were then randomized by a table of random numbers to control group (learner modeling) or experimental group (expert modeling). Six months later they returned for testing. Demographic information, including information on whether they had rotated through the NICU, how many deliveries and how many neonatal resuscitations they attended and a subjective measure of confidence were collected. Participants individually led a simulated resuscitation of an apparently stillborn baby with a confederate team of a neonatal nurse and a respiratory therapist. These simulations were videotaped; a blinded reviewer then scored the videos with a validated delivery room technical skills

assessment tool. Mean scores were calculated and compared for each group using a two tailed t-test.

RESULTS: There were no differences in NICU experience, delivery experience, neonatal resuscitation experience, or confidence between the two groups. The group exposed to expert modeling scored significantly higher in the technical skills: control group 10.9 \pm 4.9, expert modeling group 16.8 \pm 6.1; $p=0.007$.

DISCUSSION/CONCLUSIONS: The addition of expert modeling to simulationbased neonatal resuscitation training improves retention of technical skills over a 6 month time period. This may be secondary to the creation of an expert cognitive reference during initial training after viewing an expert model.

D.T. Leonard, None.

069

Education, competency, and assessment

Listening to the End-User: Designing a Simulation Course for Senior Trainees in Anaesthesia in the United Kingdom

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INTRODUCTION: A 2008 report from the Chief Medical Officer of England [1] called for an increase in simulation-based training in order to provide a safer healthcare system. Despite the increasing acceptance and use of simulation as a learning tool, there is little published evidence on the perceived needs of the end user. This study is the first attempt in the United Kingdom (UK) to establish the needs of senior trainees in anaesthesia from simulation.

METHODS: A questionnaire was designed, piloted and distributed electronically to all post-fellowship anaesthetic trainees in Merseyside, UK. Responses were anonymous and reminder e-mails were sent after seven and eighteen days. Two of the authors independently carried out qualitative content analysis on the answers to open questions and coded the responses into themes. The resultant themes were compared, differences of opinion addressed and a consensus reached. Answers to closed questions were expressed as percentages.

RESULTS: The response rate was 81% (64/79). 40 respondents had previously attended a simulation course. 52 felt that simulation could improve clinical performance.

The respondents felt (number of respondents in brackets) that a course should focus on specific scenarios (44), leadership (16), communication (9) and teamwork (7). Preparation for situations that stretch capabilities could be improved by practice (17), anticipation and planning (17), communication (10) and leadership (8). Simulation was thought to improve clinical qualities and performance by allowing practice (12), exposure to rare events (12), realism (11) reflection (11) and a safe environment (10).

Reasons to ensure attendance were low cost or free (32), study leave being granted (18), proper advertisement (14) and the course being compulsory (13).

DISCUSSION/CONCLUSIONS: There are many reasons for believing that a simulation-based course will meet the needs of senior anaesthetic trainees. Course design should concentrate on the non-technical skills of leadership, teamwork and communication. This need to focus on non-technical skills was reinforced by that fact that most trainees did not feel that they are let down by a lack of knowledge in a crisis situation, a finding which is consistent with previous opinion [2]. Respondents felt that they would benefit from more practice, better anticipation and planning and improved communication. These skills can be taught on a simulation-based course. The most important barrier to attendance was cost. One quarter of trainees thought the course should be

mandatory, although consideration should be given to the drawbacks of enforced attendance. Course organisers must address issues surrounding study leave and publicity. This study adds to the sparse literature on the perceived needs of the end-user in simulation-based courses. These results should assist in the design and running of UK-based crisis management courses for post-fellowship anaesthetic trainees.

REFERENCES (Optional):

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 2. Gaba DM, Fish KJ, Howard SK. *Crisis management in anesthesiology*. New York: Churchill Livingstone, 1994
- S.J. Mercer**, None.

070

Education, competency, and assessment

Using Simulation to Create a Licensure Exam for General Dentists Using Moderate Sedation

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INTRODUCTION: In 2007, the Minnesota Board of Dentistry became the first in the nation to mandate the use of simulation to certify the skills of dentists seeking to use moderate sedation. This outlines the creation, implementation, and assessment of this curriculum and examination. Ongoing research on the increased use of simulation and exam validation are also discussed.

METHODS: After meeting with faculty regarding their goals and objectives, the AHC Simulation Center's director worked to develop three medical emergency cases - laryngospasm, depressed respiration, and chest pain/MI. Two standardized patient cases - focusing on physical exam, history-taking, and correct identification of Mallampati classifications - were also developed. Finally, a skills lab using the CathSim™ simulator was added to the instruction preceding the examination. Once each case was finalized, primary trait analysis was used to finalize the assessment tools associated with each case.

RESULTS: An initial run-through of the examination using oral surgery residents indicated that the assessments and content were valid and reliable. Eleven of the 21 dentists enrolled passed the examination on the first try. One student elected to suspend his participation based on his initial performance. Using a mastery learning model, the remaining nine dentists received remediation consistent with the type of errors they made. Seven of the nine successfully completed a make-up examination. The remaining two failed the exam a second time and were not allowed to complete the clinical portion of the course (see graphic).

DISCUSSION/CONCLUSIONS: The use of simulation for practice and assessment has introduced a higher degree of standardization in the curriculum and more opportunities for formative assessment while the course is taking place. Validation of the examination is ongoing, based on additional data from subsequent students. Outcomes of this project are being watched closely by state Boards of Dentistry across the nation.

REFERENCES (Optional):

J.L. Miller, None.

Education, competency, and assessment

A Study to Identify the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SLINTS)

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Category: Education, Competency and Assessment

ABSTRACT

A Study to Identify the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS)

INTRODUCTION: Aviation and other high-risk industries acknowledged that nontechnical skill failures contributed to accidents. This led to research into the role of cognition and social interactions in safety. Efforts are ongoing to reduce adverse event rates in health care and recent psychological research in operating theatres has revealed the importance of identifying the cognitive and social skills for safe and effective performance. The focus of studies to date has been either surgeons, anaesthetists, or the whole theatre team. There is currently no non-technical skill rating system for the scrub practitioner (nurse, technician) which this study aims to produce. **Aim(s):** The aim of the study was to identify, via semi-structured interviews, which non-technical skills are essential for safe and effective performance as an operating theatre scrub practitioner and thereafter, to develop a skills taxonomy which could be used to rate and train those skills.

METHODS: Experienced scrub nurses (n₂₅) and consultant surgeons (n₉) from four Scottish hospitals were interviewed using a semi-structured design. Interview data were analysed before skill category and underlying element labels, which adequately describe the identified skills, were produced by panels of subject matter experts. Simulated scenarios are currently being filmed and will be used to train raters to use the system as well as to test the reliability of the prototype SPLINTS behavioural rating system.

RESULTS: Three main non-technical skill categories emerged as critical for safe and effective scrub practitioner performance; *situation awareness*, *communication and teamwork* and *task management*. The skill category *situation awareness* includes underlying elements labelled; gathering information, understanding information and anticipating. Elements within *communication and teamwork* include acting assertively, exchanging information and co-ordinating with others. The skill category of *task management* includes planning and preparation, maintaining standards and coping with pressure. There was less evidence of *decision making* or *leadership* skills.

CONCLUSION: When the study began in 2007, scrub nurses were the target group hence the interview participants. The authors subsequently acknowledged that this role is performed, internationally, by individuals other than nurses and so the rating system was named to represent all who perform this function within the scrub team in the operating theatre (i.e. Scrub Practitioners' List of Intraoperative Non-Technical Skills - SPLINTS). Our results indicate that *situation awareness*, *communication and teamwork* and *task management* are all skills which scrub practitioners have to acquire to perform safely and effectively. The resulting SPLINTS system will assist with rating and training these non-technical skills for scrub practitioners, however, these skills are equally important for all perioperative practitioners to acquire to compliment their technical expertise.

L. Mitchell, None.

072

Education, competency, and assessment

Simulation Based Clerkship Orientation Program for Medical Students

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INTRODUCTION: Increased demand for surgeons (up to 47% increase expected by 2020) coupled with ever-decreasing interest in surgery as a career choice is creating a deficit in US surgical workforce. Evidence suggests that active procedural participation is perceived as positive clerkship experience by students, who are more likely to opt for surgical careers. It is of utmost importance that patient safety is not compromised in an effort to retain bright medical students by allowing untrained novice trainee to engage in clinical activity. So we piloted a one day (nine hours) intensive Simulation based Clerkship Orientation Program (SCOP) for our second year medical students MS200.

METHODS: 75 MS200 (divided in 2 groups) attended the SCOP on their first day of Surgery clerkship at Penn Medicine Clinical Simulation Center in January and April. Students were divided into small group (6–8) to facilitate supervised (2 educators/group) interactive learning. 4 skills station of 1.5 hours each provided training on following skills: arterial puncture, venous blood collection and line placement; Urinary catheterization & Nasogastric tube placement; surgical scrubbing, gowning and draping; and knot tying and basic suturing skills. The first 20 minutes were spent on interactive video based tutorials (NEJM and ACS educational videos) followed by practice to proficiency skills station. Actual equipment kits and partial task trainers were used for skills training. Upon completion all trainees were required to demonstrate basic proficiency in each skill. Trainees rated their learning experience using a 4 point Likerts (4_strongly agree) feedback instrument. The course was funded by School of Medicine.

RESULTS: All trainees (100%) were able to receive the pre-clinical credentialing certificate, _5% trainees required individualized attention to achieve this. Thirty nine residents (52%) provided feedback. 100% trainee believed that the didactics were interactive and that the skills training was useful. All trainees either “Agreed” or “Strongly Agreed” that: SCOP enhanced learning better than reading or lecture alone, the knowledge and skills gained will be clinically helpful and that they feel better prepared and less anxious for their clerkship. All but four trainees expressed a strong desire to have similar orientation before clerkship in all other specialties.

CONCLUSIONS: The successful outcome of the pilot phase is encouraging and we are considering extending it further. The skills essential during clerkship are common amongst various specialties and this could serve as a generic template for other programs, although cost and logistics may prohibit wide spread implementation. Simulation science can facilitate safe introduction of medical students to clinical practice and create a more valuable learning experience during clerkship thereby generating interest for the specialty. Simulation based pre-clinical credentialing can ensure that patients safety and quality of care is not compromised during this process.

REFERENCES (Optional):

M.K. Mittal, None.

Education, competency, and assessment

Proving Worth in the Simulation Lab to Bring Students Back to the Bedside: A Foley Catheter Trial

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INTRODUCTION: Medical education has changed dramatically. The heightened patient awareness towards complications and transparency of outcomes has created a climate where medical students (MS) are being marginalized from procedural experiences despite a lack of evidence suggesting that MS place patients at increased risk after proper training. Skills training in simulation laboratory have been shown to improve procedural competence and confidence of trainees which may reduce complications such as Hospital Acquired Infection (HAI). We organized a pre-clinical credentialing program for urinary catheter placement by MS in simulation center. We hypothesized that after undergoing this hands-on educational campaign MS will demonstrate proficiency comparable to experts.

METHODS: Second year MS (n=75) underwent a faculty driven educational campaign for urinary catheter placement (UCP) based on the principles of Practice based learning and improvement before starting their surgery clinical clerkship. Students were tested after the training using a task specific check list to assess competency. Experts (surgery residents, n=21) received traditional training and defined gold standard. Simulated germs (Glogerm Inc) were used to assess sterile technique. Students sterility and technical proficiency was compared to experts using a two tailed t-test. The research was approved by the local IRB and all volunteers were required to sign an informed consent prior to participation.

RESULTS: 64MS(85%) volunteered to participate in the study and have their glogerm load and proficiency score for UCP be compared against experts. As compared to experts, students washed their hands with equal effectiveness ($p=0.2$) and maintained better sterility during the procedure ($p=0.05$), as determined by the glogerm load on the hands and perineum or catheter placed. Students also had a higher technical proficiency score for UCP ($p=0.001$). Anonymous post training feedback (n=30, response rate 47%) highlighted that most trainee believed it was a great idea to use simulated germs to highlight effectiveness of hand washing (100%) and they will now pay extra attention when washing hand before any procedure (97%).

CONCLUSIONS: With adequate education and supervision, students can perform UCP better than experts. We believe this approach will also foster student comfort and in so doing ease the transition to the bedside so that patients are less weary of their young providers. This approach can be extended to other relatively low risk procedures to assure that students are appropriately trained to become independent practitioners in the simulation centers prior to approaching patients.

REFERENCES (Optional):

M.K. Mittal, None.

Exploring Various Simulation Techniques In Applied Hemodynamic Monitoring

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INTRODUCTION: As residents first enter the field of medicine they are often confronted with the task of caring for critically ill patients with little to no clinical experience.

The American College of Critical Care Medicine (ACCM) has build upon previously established educational guidelines for residents and fellows to acquire mastery in diagnosing and treating patients with hemodynamic instability or shock amongst a multitude of other physiologic disturbances unique to the critically ill. They must also have a thorough knowledge of the type, proper placement and potential complications of invasive monitors used[1]. Studies have been conducted on critical care practitioners and trainees providing acute resuscitation in high fidelity simulation indicating that this mode of training is both valid and reliable to evaluate acute care skills.

METHODS: The Hemodynamic Monitoring Workshop consists of a didactic lecture, two sessions on central line placement and waveform analysis of Swan Ganz catheters and the Vigeleo, and a series of simulations of critically ill patients that would be encountered in the SICU in various forms of hemodynamic instability or shock. Nineteen surgical interns were invited to participate in this day long workshop and prospective data was collected in the cognitive domain in the form of a pre- and post-test and in the form of a survey. The Simulation scenarios were presented in two formats: independent and joint. The independent format consisted of having groups of participants focus on one scenario throughout the whole exercise while the joint scenario consisted of the participants starting a simulation scenario in one mock operating room and then being paged to move to a second operating room. The participants were required to continually check on the status of multiple patients, much like what would be expected in a real intensive care unit.

RESULTS: A post survey that was administered upon completion of the workshop indicated that all participants found the simulation scenarios to be beneficial to their education. (13/19) participants indicated that they found the joint scenario to be most beneficial and provided a more realistic hospital environment.

DISCUSSION/CONCLUSIONS: The joint scenario simulation format was greatly preferred amongst all of the participants. Participants provided feedback to instructors indicating that it was more reflective of a chaotic intensive care unit with multiple demands and changing environmental constraints. Using this joint technique opened up more issues for discussion during the debriefing sessions as it enabled students to think about other challenges that might arise in the ICU when monitoring the hemodynamic status of multiple patients at the same time.

REFERENCES (Optional):

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S. Nagar, None.

075

Education, competency, and assessment

The Development and Implementation of an Undergraduate Curriculum in Obstetrical Simulation

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INTRODUCTION: As simulation becomes more common in post-graduate medical education, the question whether to introduce simulation into undergraduate teaching becomes relevant. Previously, formal teaching for clerkship students in obstetrics and gynecology at the University of Ottawa consisted of didactic lectures. The objective of this study is to assess the effectiveness of a new simulator-based curriculum on learning during the obstetrics clerkship. As a secondary outcome, it is hoped that these sessions will engage the students and will lessen their anxiety at the start of their rotation.

METHODS: A structured simulation-based curriculum was developed in accordance with the educational objectives of the Association of Professors of Gynecology and Obstetrics. 110 students (class of 2010) at the University of Ottawa attended a small group session at the Ottawa Skills and Simulation Centre, incorporating the use of a high-fidelity obstetrical mannequin. The curriculum is based on a single obstetrical patient whose clinical course the students follow from her initial presentation to eventual delivery. The students completed a pre-test prior to, and an identical post-test immediately after the session. Written feedback was obtained from one group of students.

RESULTS: Performance on the two tests was compared using inferential and descriptive statistics. Median student score increased significantly from 40.0% (14/35, SD _ 5.5) on the pre-test to 71.4% (25/35, SD_4.3) on the post-test ($p_{0.01}$). The range of scores on the pre-test was 2–29/35 and improved to 9–33/35 post-test. 38 students rated “overall quality of the session” and “appropriateness of the topic” on a 10-point Likert scale. The mean scores for quality and appropriateness were 8.7/10 and 9.1/10, respectively. INSERT MISSING INFO HERE

DISCUSSION/CONCLUSIONS: High-fidelity simulation can be a useful adjunct to current undergraduate education. A structured, interactive simulation curriculum in obstetrics can be an effective teaching approach, and appeared to be well received by medical students.

REFERENCES (Optional):

A. Nakajima, None.

076

Education, competency, and assessment

Seeing is Believing: Evaluating Scenario Based Learning Outcomes in Participant and Observer Groups

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INTRODUCTION: The aim was to examine the value of facilitated observation for a group of medical and nursing students during an inter-professional simulated ward exercise. A series of pilot inter professional simulated ward exercises were developed, conducted and evaluated in a joint Skills Development Centre and University of Queensland Faculty of Health Sciences project. The objectives of the exercise included introducing students to an inter professional learning environment, and developing students’ awareness and understanding of non technical skills and their impact on clinical performance, to improve work readiness on graduation. Scenario specific objectives

included inter professional team work, role identity, challenging communications, time management and prioritisation.

METHODS: Three ward exercises involving five hours of simulation and debriefing were conducted. Each iteration featured nine standardised patients managed by three nursing and two medical students, with senior staff available as appropriate. Prior to the exercise, students were allocated either a participant or observer role. Participants performed as newly graduated practitioners through three related scenarios, with “ward time” suspended during the debriefing phase. The observer group observed the ward simulation via video link, with facilitation throughout by a member of the faculty. All students, both participants and observers, actively engaged in the debrief process. Pre and post course questionnaires (modified Readiness for Interprofessional Learning Scale(1)), self perception tools and post course telephone interviews were conducted, to evaluate efficacy of these pilot exercises.

RESULTS: Pre ward exercise questionnaires indicated high levels of readiness for inter-professional learning. Analysis of questionnaires and students’ reports exhibited increases in both the participant and observer groups in attitudinal changes towards inter-professional learning. Preliminary findings of student interviews indicated similar learning perceptions and perceived benefit of the experience between participants and observers. Consistent feedback from students was that the simulation provided a busy, realistic ward environment. It provides a safe opportunity to improve time management, prioritisation and communication skills with no risk to patients. The opportunity to safely practise participating in care during a clinical crisis was seen as important and valued. Whilst all student feedback indicated the scenarios were very busy, this view was not shared by clinical members of the Skills Development Centre and University of Queensland Faculty of Health Sciences.

DISCUSSION/CONCLUSIONS: Evaluation data suggests that facilitated observation of a simulated event can produce comparable perceived learning outcomes similar to that of participation. This may benefit areas where large numbers of students are required to undertake an activity which is traditionally conducted on a high faculty to student ratio.

REFERENCES (Optional):

P.A. Neads, None.

077

Education, competency, and assessment

Development and Evaluation of the Debriefing Script for Pediatric Resuscitation Education : A Report from the EXPRESS Pediatric Research Collaborative

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INTRODUCTION: Training of novice instructors for widely disseminated resuscitation courses such as Pediatric Advanced Life Support (PALS) or Advanced Cardiac Life Support (ACLS) is a substantial and challenging endeavor that requires many manhours, not only to initially train many instructors from various medical backgrounds, but also to maintain this training every 2 years. Instructor training is often not standardized and regular retraining is not mandated. This may lead to variability in the

quality of instruction from center to center. To help address this problem, our team of simulation and pediatric resuscitation experts (EXPRESS investigators) has developed a debriefing script that novice instructors could use to direct teaching or debriefing sessions with students during PALS.

METHODS: The goal of the script was to highlight critical components of PALS training so that novice instructors could read the script and be able to discuss PALS guidelines with minimal pre-course training. A group of experts in pediatric resuscitation and PALS was convened in January 2007 to discuss potential content of the script. This group identified critical components for the script, and grouped them into 2 categories: medical aspects of patient care and crisis resource management. After this meeting, script authors met to finalize script content, keeping in mind the ultimate goal of making the tool as generalizable as possible for all types of resuscitation classes. Once content was finalized, script format and layout was discussed with input from various experts in debriefing and simulation. Such a script should be user-friendly and have potential applicability in other settings. We chose primary colors to highlight important objectives: yellow for ABC evaluation and venous access, red for high quality CPR and green for rhythm recognition and algorithm management. The script was divided into ‘performed well’ and ‘needs work’ columns for each major objective. In order to further improve script usability, we consulted human factors experts and education and organizational performance specialists to review and critique the script. Based on expert recommendations, we redesigned the script to reflect the advocacy-inquiry approach to debriefing in an attempt to engage participants and determine their frames of reference. Once finalized, the script was used in the EXPRESS research project where 24 novice instructors were recruited to give 20 minute debriefings using the new script. A team of 8 reviewers were asked to view these videotaped debriefings and give subjective feedback on how the script influenced the nature of the debriefing.

RESULTS: The script was used by 24 novice instructors as part of the EXPRESS research project. After viewing these videos, the reviewers reported the script facilitated instructors to: organize the debriefing in a structured fashion, provide an outline for time management, ask questions which lead to interesting discussion, address crisis resource management principles, and summarize key learning points at the end of debriefings.

CONCLUSIONS: We have developed a generalizable debriefing script for novice instructors to guide resuscitation teaching for students from various medical backgrounds. Anecdotally, this script appears to subjectively help novice instructors with various aspects of debriefing.

K. Nelson, None.

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Education, competency, and assessment

“Rolling Refreshers”: One Step Towards Translating CPR Competence on Manikins to Operational Performance on Patients

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INTRODUCTION: High quality CPR skill retention is poor. A “just-in-time” and “just-in-place” CPR Rolling Refresher program was developed using simulation to practice and refresh CPR chest compression skills according to American Heart Association (AHA) guidelines.

METHODS: Institutional Review Board waiver was obtained. In the Pediatric Intensive Care Unit (PICU) the 5 patients at highest risk of cardiac arrest were subjectively identified daily by clinical staff (physicians and nurses). “Rolling Refresher” training consisting of a 3 minute bedside hands-on analysis of CPR skills facilitated by a BLS instructor and optimized with defibrillator audiovisual corrective feedback was implemented specifically to the multidisciplinary bedside providers caring for those patients. Each provider practiced chest compressions (CC) until skill success was attained, defined prospectively as requiring no further corrective prompts for 20 consecutive compressions. Audiovisual prompts were given in accordance with AHA guidelines to maintain a rate of 90–120 CC/min, depth \geq 38mm and residual leaning force \geq 2.5kg. Participants were randomly surveyed for self-perceived program training efficacy. Data analyzed by descriptive statistics.

RESULTS: Between September 2006 and July 2009, 2,537 Rolling Refreshers were conducted in the PICU among nurses (73%), physicians (19%), respiratory therapists (4%), and other (4%) clinical staff. All (100%) were able to meet CPR skill success targets during training. 32 of 38 (84%) surveys distributed to participants were completed. 31 of 32 (97%) participants reported that “Rolling Refreshers” assist in maintaining excellent CPR skills. Of participants who delivered CCs during an actual cardiac arrest, 23 of 26 (89%) reported that the “Rolling Refreshers” assisted their operational performance of CCs on patients.

CONCLUSIONS: A novel “Rolling Refresher” CPR skill training approach using “just-in-time” and “just-in-place” simulation is well received by PICU staff. During actual pediatric cardiac arrest resuscitations, participants perceived “Rolling Refreshers” improved their CPR chest compression skills. Further study is needed to determine timing, intensity, frequency and types of psychomotor refresher CPR training to maintain effective CPR provider competence. **Funding:** Laerdal Foundation for Acute Care Medicine

D.E. Niles, None.

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Education, competency, and assessment

New Tradition Continues: Pediatric Critical Care Fellowship

Orientation Bootcamp

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Abstract

TITLE: New tradition continues: Pediatric Critical Care Fellowship

Orientation Bootcamp

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INSTITUTIONS (ALL): 1. Anesthesiology and CCM, CHOP, Philadelphia, PA, USA.
2. PCCM Bootcamp Consortium, Philadelphia, PA, USA.

INTRODUCTION: A unique multi-institutional Pediatric Critical Care Medicine (PCCM) fellowship orientation simulation “Bootcamp” program was launched in 2006. This new tradition continues with voluntary participation of regional PCCM fellowship programs.

HYPOTHESIS: Simulation-based PCCM Fellowship “Bootcamp” is perceived effective

after one and six months by participating fellows.

METHODS: A 2.5 day multi-center PCCM Fellowship “Bootcamp” was held during 1st mo of fellowship for four years (2006 –2009). Curriculum focusing on technical (**Tech**) and teamwork (**TW**) training in 5 common clinical categories: airway, vascular access, resuscitation, sepsis, trauma/traumatic brain injury, with brief didactic lectures, small group discussions, technical skill stations with a task trainer, and team training stations using a whole body simulator. Fellows reported clinical experience, perceived training effectiveness and self-confidence in both Tech and TW at 1 mo and 6 mo after the training with Likert scale(1_low 7_high). Descriptive statistics with Mean_SD, and statistical test with T-test and linear regression.

RESULTS: 101 1st year fellows from 15 PCCM programs participated over 4 years. 37/46 (80%) of 2007 and 2008 fellows responded to follow-up survey at 1mo and 6mo. Clinical experience during initial 6mo of fellowship varies substantially among fellows. Self-confidence was significantly higher at 6 mo vs 1 mo in both Tech (5.4_1.0 vs 5.7_0.9, p_0.01), and in TW (5.4_1.0 vs 5.6_0.8, p_ 0.018). Perceived training effectiveness at 6 months was high in both Tech (5.7_0.9) and TW skills (5.6_0.8). Regression analysis showed that after adjusting for clinical experience and the year, self-confidence in Tech was significantly associated with perceived training effectiveness (t_4.32, p_0. 001: Model R-square_0.15, F(3,147)_8.65, p_0.0001). This finding was similar in self-confidence in TW with perceived training effectiveness (t_3.73, p_0.001: Model R-square_0.17, F (3,147) _10.37, p_0.0001).

CONCLUSIONS: A unique multi-institutional PCCM fellowship orientation simulation “Bootcamp” is successful and perceived effective at 6 months after the training. A large variance in clinical experience during this period highlights the importance of this educational experience. Supported by Endowed Chair, Critical Care Medicine
A. Nishisaki, None.

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Education, competency, and assessment

Assessing the Face and Content Validity of an In-Utero Stent Task Trainer for Maternal Fetal Medicine Fellows and Faculty

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INTRODUCTION: Learning the basic skills for performing in-utero stenting for fetal bladder outlet obstruction or pleural effusion is difficult as no models for training exist. In order to enhance training while providing improved opportunity for demonstrated proficiency, we developed and tested a low-cost model to practice in-utero stenting under ultrasound guidance.

METHODS: A hands-on demonstration workshop for ultrasound guided needle procedures was given at the Annual Meeting for the Society of Maternal Fetal Medicine. Participants engaged in a series of eight clinical stations which had models to perform various aspects of genetic amniocentesis, transabdominal and transcervical chorionic villus sampling, and in-utero stent placement. Participants completed pre- and postworkshop evaluations assessing demographics, experience, and model evaluation.

RESULTS: Following the personal use of the in-utero stent, 89% (16/18) of attending physicians and 100% (5/5) MFM fellows felt it appeared appropriated when viewed sonographically. 92% (11/12) of attending physicians and 100% (3/3) of MFM fellows described appropriate realism of tissue resistance. Two fellows and 6 faculty did not know if the model felt real, as they had not performed the procedure. One hundred percent of attendees agreed that these models could be used to teach proper technique

to fellows and staff. Eighty-three percent (19/23) of attending physicians and 100% (7/7) of MFM fellows responded that they would personally make these models for use as practice or to teach fellows/staff. Seventy-seven percent (17/22) of the responding faculty and 86% (6/7) of MFM fellows felt that they would purchase such a model if commercially available.

DISCUSSION/CONCLUSIONS: The in-utero stent training model appears to have good face and content validity. These tools will be valuable educational adjuncts to facilitate training in this ultrasound guided needle procedures.

REFERENCES (Optional):

J. Nitsche, None.

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Education, competency, and assessment

Simulation Training Increases Intensivist Competence in Difficult Airway Management

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⁴Warren Alpert School of Medicine of Brown University, Providence, RI.

INTRODUCTION: Difficult airway management is a complex, high risk area of critical care medicine. The American College of Chest Physicians Difficult Airway Management Course provides practicing Pulmonary / Critical Care physicians with an intensive simulation training experience to improve medical knowledge and procedural skills in airway management.

METHODS: The Difficult Airway Course is a 2.5 day simulation education program that includes task trainer and high fidelity training modules to provide a hands-on experience with the preparation, teamwork, and tools necessary to manage airway emergencies. Participants complete a demographic survey and a self-assessment of confidence with airway management skills pre- and post-course. Learners also undergo a 10 question objective written examination and an assessment of airway procedural skills using a standardized high fidelity scenario with a check list evaluation at the beginning and the end of the course.

RESULTS: Seventeen learners with a wide variety of practice experience participated in the March 2009 course. Learners reported significant improvements in clinical confidence in all course domains at the end of the course, including airway assessment, bag-valve mask ventilation, intubation and application of advanced airway tools to manage the failed airway. Pre- and post-course written assessments demonstrated an increase in the mean percentage of correct answers (69_22% vs 77_17%, p_0.025). Mean time for preparation and intubation of a high fidelity standardized patient increased by 12% (8.3_3.2 min vs 9.3_2.9 min, p_0.89), despite a 30% increase in the percentage of correctly completed preparation and procedure steps (50_13% vs 65_9%, p_0.002).

DISCUSSION/CONCLUSIONS: An intensive simulation course in difficult airway management improved both novice and experienced intensivist confidence, procedural preparation and technical skill in airway management. Further research is needed to determine if the medical knowledge and skills gained through this experience result in changes in physician clinical practice and patient outcomes.

A.S. Niven, ACCP Faculty, Speaking and Teaching, Honoraria.

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Education, competency, and assessment

Longitudinal Evaluation Of Resident Performance In Simulated Scenarios Using Global Assessment Ratings

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INTRODUCTION: There is debate regarding the optimal method to assess resident performance in simulated scenarios. Use of global ratings may be a reproducible, efficient and reliable method to measure increasing levels of expertise. The purpose of this study was to compare global performance ratings of anesthesiology residents at six weeks of training to one year.

METHODS: Twenty-two residents were eligible, and all participated in this IRB-approved study. Residents received simulation-based instruction in critical events during their first six weeks of anesthesiology training and were tested at six weeks. Subjects were subsequently re-evaluated at one year of training. Raters blinded to the subject's identity scored residents' performance in six scenarios using seven global assessment items for each scenario. These items were: prioritizing information, task sequencing, contingency planning, multi-tasking, explaining thought process, actions corresponding to severity of problem, and managing help. Raters evaluated each resident on a detailed descriptive scale from 1 (inexperienced) to 6 (expected performance at 18 months of training).

RESULTS: Data from 22 residents were analyzed. Average scores for each of the seven global assessment items were analyzed as a percentage of the expected milestone score at six weeks (4) and at one year (5). Percentage of milestone achievement at six weeks was compared to one year using the paired t-test. Scores were significantly closer to the expected milestone at one year compared to six weeks for all items except for managing help.

CONCLUSIONS: Global assessments of novice anesthesia resident performance in simulated critical events suggest that residents achieved expected milestones at six weeks and one year. Calling for help was not significantly improved at one year. This finding highlights an area of potential need for emphasis. Periodic evaluation of performance in standardized, simulated scenarios may be a method to evaluate progressive achievement of milestones during residency.

S.E. Olson, None.

083

Education, competency, and assessment

Benchmarking Performance in Simulated Critical Event Scenarios Using Global Assessment Ratings

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INTRODUCTION: There is debate regarding the optimal method to assess performance in simulated scenarios. Use of global ratings may be a reproducible, efficient and reliable method to measure increasing levels of expertise. An analysis of individual items in a global assessment tool developed in our institution has been shown to measure improvement in performance over time. The purpose of this study was to analyze interval performance scores of anesthesiology residents using overall global assessment ratings.

METHOD: Twenty-two residents were eligible, and all participated in this IRB-approved study. Residents received simulation-based instruction in critical events during

their first six weeks of anesthesiology training and were tested at six weeks. The test was subsequently repeated at one year of training. Raters blinded to the subject's identity evaluated performance in six simulated scenarios using seven global assessment items. Raters scored each subject on a detailed descriptive scale from 1 (inexperienced) to 6 (expected performance at 18 months of training).

RESULTS: Data from 22 residents were analyzed. Overall global assessment scores for each subject were calculated using means values of 42 ratings comprising the seven global assessment items for each of the six scenarios. Scores at six weeks and at one year were plotted (Figure 1). Based on score clustering and the minimum clinical expectation for performance, hypothetical threshold scores of 3.5 and 4.6, respectively, were determined. Five subjects were below the threshold at six weeks, and three subjects were below the threshold at one year. Two subjects were below the threshold at both six weeks and one year.

CONCLUSIONS: Global assessments of performance in simulated critical events demonstrate that most subjects' overall scores were clustered closely together with several outliers. Use of a global assessment tool for periodic evaluation of simulated critical event management may be a potential method for determining performance benchmarks.

C.S. Park, None.

084

Education, competency, and assessment

**Learner Perspective On Effectiveness Of A Comprehensive
Simulation Curriculum For Obstetrics And Gynecology
Resident Skill Development**

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INTRODUCTION: The purpose of this study was to develop a comprehensive yearround simulation curriculum for obstetrics and gynecology residents and to measure learner perceptions of how the curriculum improved their knowledge and met their learning goals.

METHODS: A differentiated simulation based curriculum, including skills in both gynecology and obstetrics, was developed and delivered as part of the technical skills curriculum of an integrated academic residency training program. Twenty four sessions were taught over a 12 month academic year. Course topics included basic and advanced skills, elements of routine and emergency care including: laparoscopy, hysteroscopy, knot-tying, suturing, normal vaginal and cesarean section delivery, episiotomy repair, operative vaginal delivery, vaginal breech delivery, family planning, circumcision, postpartum hemorrhage management, surgical teaching, and team training. Residents were surveyed on a five-point Likert scale on the courses impact on their understanding of the surgical procedure and skills, as well as whether the course met their learning needs. Results were aggregated by session. Not all residents participated in all sessions, but evaluated the sessions they did attend.

RESULTS: Twenty-two learners responded to the end of the year evaluation of the simulation curriculum. Twenty-four teaching sessions were held in 2008–2009, with total instruction time of fifty hours. Forty-one percent (10/24) of the sessions focused on obstetrical skills and procedures and 66% (16/24) sessions were gynecologic specific skills or procedures. These sessions all included didactic instruction and hands on teaching with deliberate practice of the targeted skills. There were 12 faculty course directors and 18 additional faculty served as course facilitators. Of these sessions, “Family

Planning Simulation” including vacuum aspiration and family planning emergencies was the highest rated in learner perception of improvement of skills and needs met (4.80, 4.80). The second highest session was the PGY 2 specific “Obstetrics Emergency Teamwork and Communication Training” (4.75, 4.75). “Neonatal Resuscitation” was the lowest rated session by the learners (3.11, 3.00), but still felt the session improved their understanding of the skill. **Discussion:** A comprehensive simulation curriculum for obstetrics and gynecological surgical skills is feasible in an academic teaching center. From a learner’s perspective, this curriculum can improve skill and procedural knowledge as well as meet developmental goals.

S.E. Peyre, None.

085

Education, competency, and assessment

Visualizing Decision Making in Simulations: A Novel Tool for Objective Debriefing

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INTRODUCTION: One goal of the debriefing process of simulation exercises is to provide participants with feedback on their performance based on critical decisions made. However, facilitators traditionally evaluate performance using subjective criteria based on a history of personal observations rather than on objective, statistical data. This reduces the inter-rater reliability of the debriefing process. The goal of this research is to create a novel tool that generates visual narratives of simulation performance based on a collection of objective data.

METHODS: An existing computer program read logs from from Laerdal® SimMan™ simulations, extracted XML data, and uploaded it to a relational database. We created a separate program that queries the logs in the database in real time and parses them for critical decisions and their corresponding timestamps. We developed a visualization technique to display participant performance. To test this tool, seventy-two logs of a mannequin-based simulation scenario of uncal herniation were examined.

RESULTS: For each log, the program generates a directed graph with nodes representing critical decision states and directed links showing the order of actions taken. The vertical extent of each link represents the time between decisions, measured relative to the sample average over all participants who followed the same link. The thickness of each link represents the overall percentage of participants who followed the same link.

DISCUSSION/CONCLUSIONS: The debrief is an important component of medical simulation-based training. However, its quality is often facilitator-dependent. The tool described here helps participants visualize their simulation performance in a simple, reliable, and objective fashion. A future feature will allow participants to compare their performance to those within specific demographics, such as medical students, residents, or experts. In future research, we will explore if this tool increases the interrater reliability of the debriefing process.

REFERENCES (Optional):

S. Pham, None.

086

Education, competency, and assessment

A Means to Improve Debriefing by Graphing Outcomes as a Function of Actions

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INTRODUCTION: Effective debriefing is critical to realizing the educational goals and objectives of simulation-based training. During this phase of the simulation experience a facilitator must distill the actions taken and emphasize those that caused significant outcomes. Current debriefing modalities are not optimized for visualizing this causality between actions and effects directly. The goal of this research is to assist facilitator debriefing by developing a novel tool that graphically displays the effect of actions in a simulation upon vital signs.

METHODS: An existing computer program read logs from from Laerdal® SimMan™ simulations, extracted XML data, and uploaded it to a relational database. We created a separate program that queries the logs in the database in real time and parses them for critical decisions and their corresponding timestamps. We developed a visualization technique to display participant performance. To test this tool, seventy-two logs of a mannequin-based simulation scenario of uncal herniation were examined.

RESULTS: For each log, the program generates a 2Dgraph with a timeline of events on the abscissa and vital signs on the ordinate. The participant's performance can be displayed alone, or overlaid upon vital sign values for all participants to provide global context.

DISCUSSION/CONCLUSIONS: Successful debriefing requires the facilitator to identify critical decisions and their resulting outcomes. Current debriefing techniques, such as video or log review, are not visually intuitive and can be time consuming. This tool graphically displays the temporal relationship between actions in simulation exercises and the vital sign trends that follow them. A facilitator using this tool can help participants recognize these temporal relationships as causal ones, which can reinforce appropriate decisions or correct inappropriate ones by demonstrating their impact in an efficient, standardized manner.

REFERENCES (Optional):

S. Pham, None.

087

Education, competency, and assessment

The Usability of Virtual Nephron Simulation as a Tool for Medical Education

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I. Background: This paper describes a usability study performed over an interactive virtual reality (VR) simulation designed to understand a difficult concept: the nephron. This constitutes a step forward in the introduction of a virtual nephron model for standard medical school curricula. The history of this research starts with experiments performed using a virtual patient (VP) simulation [1] and [2], demonstrated that students can learn using virtual patients. Subsequent research compared the effectiveness (which is an important component of usability) of various degrees of VR immersion

[3]. Such studies should provide a cost/benefit basis, among other things. In this latest work, we bring the VR simulation of a nephron offering learners the opportunity to interact with otherwise complex abstract ideas and principles.

II. Tools and Methods: The simulation used in this study features an interactive virtual nephron working in a healthy modality. Computer graphics and interactive VR technology is used to display the many chemical balances and exchanges occurring inside kidney's nephron. The VR development tool is Flatland [5], an open source simulation engine developed at The University of New Mexico, that has been used to develop several medical simulations. Data was collected from first-year medical students, enrolled in the CV/Pulm/Renal block in 2009, using paper and online questionnaire. Students were randomly assigned to either an experimental group which will have access to the interactive, virtual model of the nephron or to a control group without access to the virtual model. Questionnaire scores were used to assess usability as efficacy, efficiency, and satisfaction.

III. Discussion: Usability is a concept that helps to understanding how much a developed system will be accepted by users. From the stand point of research on education it describes the ease of learning with a given tool. Initial analyses of results find that students who did use the model (17) found it to be conceptually accurate and felt it helped their recognition of the visual layout of the nephron their understanding of the nephron functions including Na₊ reabsorption and action of the sodium pumps. Despite finding the exercise useful, several participants felt the draft model needs more time in development to fine tune the usability.

IV. Conclusion: The usability of the nephron simulator as a learning tool has been measured. Usability analysis of the application to a real medical education activity showed positive results.

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H.E. Phillips, None.

088

Education, competency, and assessment

Successful Implementation of an Automated Orientation Tool to a Simulation-Based Training Program

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INTRODUCTION: Orientation to the simulation environment is likely an important component to simulation based education and assessment programs. Simulation program participants should be apprised of the expectations, fidelity and orientation to the simulation equipment and environment. The orientation process may be able to be

either fully or partially automated to reduce the amount of instructor or technician resources required to complete the task.

METHOD: A user-driven automated simulator orientation tool was included as part of the orientation to a simulation based difficult airway training program for paramedics. It provided orientation to the room environment and the simulator used for the program. The tool supplemented a PowerPoint used during the orientation of the program that described the limitations of the fidelity of the equipment and environment. We report the participants' perception to the orientation of the program over a period of July 2007 through December 2008 as recorded on a web-based post-course evaluation using a 9 point Likert scale for a statement "My Orientation to the Simulation Environment was Adequate".

RESULTS: 356 paramedics participated in one of the 44 courses and 334 (94%) completed the on-line post course evaluation with 332 responding to the orientation statement. 311 of 332 (94%) of responses were reported in the range seven through nine (agree to strongly agree) as shown in table 1.

CONCLUSION: Orientation to the simulation environment for a paramedic difficult airway training program can be adequately accomplished by combining a live presentation with an automated orientation tool for the vast majority of participants.

P.E. Phrampus, None.

089

Education, competency, and assessment

Perception of Realism and Course Relevance Compared to Years of Experience in a Simulation Based Paramedic Airway Training Program

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INTRODUCTION: Adult learners have accumulated a foundation of life experiences and knowledge that may include work-related activities, social responsibilities, and previous education. They need to connect learning to their experiences and knowledge. Therefore, years of professional experience could be one of important contributing factors for creating effective simulation based training programs involving experienced practitioners. The purpose of this study is to evaluate whether the paramedics' responses to a simulation-based training course evaluation is related with their years of professional experience.

METHODS: We analyzed the cumulated data on web-based post-course evaluation instrument for a simulation-based paramedic difficult airway training program (Advanced Prehospital Airway Management Course) conducted at an academic based simulation center from July 2007 to December 2008. Simple correlation analysis was performed with trainees' years of professional experience and their responses (9-points Likert scale) to questions about components of the training program (web-based precourse curriculum, lecture, skills workshop, patient simulation), and pre- and post-test score. Additionally, we also divided the data into four subgroups by the years of professional experience (group I, <1 yr; group II, 2–9 yrs; group III, 10–19 yrs; group IV, ≥20 yrs) and compared the data of each subgroup with one-way analysis of variance and subsequent post hoc test.

RESULTS: Overall, 356 paramedics participated in one of the 44 courses and 334 (94%) completed the on-line post course evaluation. The median years of professional experience of paramedic was 10 (1–34). In the correlation analysis, there was no significant relationship between years of professional experience and most of components of

the simulation-based airway training program (overall course rating, lecture, skill workshop, realism or challenge of simulation scenario, debriefing). There was a weakly positive correlation between years of professional experience and length of skill workshop ($r=0.131$, $p=0.023$). There were also weakly negative correlation between years of professional experience and rating of pre-course curriculum ($r=-0.147$, $p=0.010$). In comparison of four groups, group I more highly rated pre-course curriculum ($p=0.048$) than the other three groups. Group II rated the length of skills workshop (partial task training without a simulation scenario) slightly more poorly ($p=0.011$).

CONCLUSION: We were able to create a simulation-based paramedic difficult airway training program that was perceived as realistic and challenging to a cohort of trainees covering a wide range of experience, and did not vary considerably based on years of experience. Paramedics who have less professional experience seemed to rate the availability of web-based pre-course review information slightly higher than those with more experience. More time to practice individual skills may be more needed for paramedics who work in most active years of their profession.

P.E. Phrampus, None.

090

Education, competency, and assessment

Simulation Experience and Practicing Emergency Physicians' Perceptions to a Simulation-Based Difficult Airway Training Program

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INTRODUCTION: Patient simulation provides various learning experiences and stressors to participants through the use of new educational tool and methods that includes direct observation and then candid debriefing of the simulation. It is postulated that many participants are uncomfortable with the process initially and that the reluctance is overcome as they become accustomed to simulation methodology. The need for familiarization could be decreased in participants who have already been exposed to simulation. The purpose of this analysis is to evaluate whether prior simulation experiences influence trainees' responses to a simulation-based training program.

METHODS: We analyzed the cumulated data of web-based pre- and post-course survey on a simulation-based airway training program (Difficult Airway Management - Emergency Medicine) conducted at an academic based simulation center from October 2005 to May 2009. The data was divided into two groups, group A, who reported prior simulation experience; group B, who reported no experience. We compared the trainees' pre-course perceptions (5-point Likert scale) to five questions about reasons for discomfort with simulation-based difficult airway training and post-course responses (9-point Likert scale) to nine questions associated with components of the patient simulation training of two groups with Student's t-test.

RESULTS: Overall, 162 practicing emergency physicians participated in one of the 28 courses and 152 (94%) completed the survey. Group A was less uncomfortable for complicated algorithm simulation-based training than group B ($1.78_{-0.81}$ vs. $2.24_{-1.08}$, $p=0.004$). There was no significant difference between two groups in responses to positive effects of simulation-based training (identify weakness, improve on them, and apply to practice; improve confidence). Responses to the realism and challenge of scenario, satisfaction with debriefing experience and debriefing manner were positive and also not significantly different between two groups. The rating for a question ("The scenarios were appropriate for my level of education") of group B was only

significantly higher than group A (8.33_1.19 vs. 7.89_1.25, $p=0.034$).

CONCLUSION: Prior full-scale patient simulation experiences may make trainee more comfortable for complicated algorithm simulation-based education and assessment program. If a simulation-based training program is well-organized, trainees who have no prior experience of full-scale patient simulation may feel comfortable and satisfied with the program. Prior simulation experience did not seem to factor into the recognizing the value of simulation based training for difficult airway management in a cohort of emergency physicians.

P.E. Phrampus, None.

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Education, competency, and assessment

Simulation Scenario and Environment Design: Perceptions of Realism and Value Reported by Practicing Paramedics

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INTRODUCTION: Simulation-based scenarios are designed based upon needs to accomplish learning and assessment objectives. Decisions that impact the scenario design often involve careful consideration of the intended audience, available equipment, environments as well as the fidelity available to recreate the situation. Although there is often significant passion, there is little objective data to help with decision making regarding the environmental fidelity (physical surroundings) as well as selection of simulation equipment that should be included in simulation programs. We describe the perceptions of realism and value of practicing paramedics who participated in a simulation based program focusing on difficult airway management.

METHODS: We report on the results of a post-course evaluation survey instrument used to evaluate the advance paramedic airway management (APAM) program conducted at a university-based academic simulation center from July 2007 through December 2008. The program consists of an asynchronous web-based review followed by an eight hour program in a simulation center that is largely hands on experience. The simulation scenarios were based on actual difficult airway cases that occurred in the field and were pre-programmed into the simulators. At the beginning of each scenario the team leader was handed a scenario card that indicated the scenario, setting and available resources as well as approximate distance from a hospital. Patient simulations utilized the SimMan® patient simulator platform. The simulation center rooms were generic, with basic equipment such as oxygen connections, suction and basic airway equipment and a high fidelity patient simulator monitor screen. There were no other props, pictures, videos or environmental stimulus to indicate a prehospital environment. Participants received a standard briefing with PowerPoint at the beginning of the day, followed by an automated, hands on orientation to the simulator. Participants completed a post course web-based evaluation tool consisting of Likert style inquiry and the ability to enter free text responses.

RESULTS: 356 paramedics participated in one of the 44 courses and 334 (94%) completed the on-line post course evaluation. The median years of experience of the participants was 10 (range: 1–34). Scenario realism was categorized in the top three highest (7–9) by 293 (88%); level of challenge 286 (86%); improving of technical skills 299(90%) improvement of medical knowledge 291(87%), improving judgment skills 297(89%); appropriateness for level of education 299 (90%) and overall value of simulations to the learning 308 (92%). Of 999 free text comments, 26 requested scenarios to be longer, 22 positively reflected scenario based practice, 27 reflecting positively on

exposure to the simulators, 63 reflecting positively on the “hand-on” design of the program and none on the realism of the scenarios, environment or equipment.

CONCLUSIONS: Difficult airway management scenarios conducted as part of an organized program were extremely well received by a significant majority of practicing paramedics. The overwhelming majority of their participants indicate the scenarios were highly realistic, relevant and of value to their profession. Well designed simulation programs that focus on learning and assessment objectives may be able to be conducted without extensive manipulations of the physical environment.

P.E. Phrampus, None.

092

Education, competency, and assessment

Perceptions of Relevance and Program Design for a Simulation-Based Paramedic Difficult Airway Training Program

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INTRODUCTION: Simulation-based curriculums are designed upon learning and assessment objectives that are to be accomplished. Decisions that impact the curriculum design often involve careful consideration of the intended audience, available equipment, environments as well as the fidelity of the simulation. Airway management is an important aspect of the scope of practice of paramedics in the field. Previous literature has shown there is increasing need to ensure better training and experience with regard to airway management for field EMS providers. We report the perceptions of practicing paramedics on the initial 18 months of a simulation based training program focusing on prehospital difficult airway management.

METHODS: We have analyzed the results of a post-course evaluation survey instrument used to evaluate the advance paramedic airway management program (APAM) conducted at a university-based academic simulation center from July 2007 through December 2008. The program included an asynchronous web-based review of relevant materials containing approximately 4 hours. This is followed by an eight hour program, on-site in a simulation center. The evaluation tool was web based and included Likert style inquiry as well as the ability to enter free text comments for select items. This analysis focuses on perception of relevance, simulation realism, challenge to the participant and overall curriculum design.

RESULTS: 356 paramedics participated in one of the 44 courses and 334 (94%) completed the on-line post course evaluation. The median years of professional experience of the participant was 10 (1–34). In the four inquiries regarding relevance to level of training and course satisfaction there were a total of 1,307 responses, with 1,236 (95%) in the top three rated categories. There were five inquiries regarding the helpfulness and organization of the pre-course, web based materials. There were a total of 1,645 responses, with 1,416 (87%) ranked in the top three categories. When asked about the overall length of the program there were 326 responses to query the satisfaction with the length of the workshop with 232 (71%) indicating “just right”, and 62(20%) “too short” and 30(9%) responding “too long”. When asked how often should training be repeated of the 334 participants completing the survey 73 (22%) indicated 18 months, 159(48%) indicated one year, 34(10%) indicated 6 months,, 34(10%) indicated 3 months and , 34(10%) did not respond.

CONCLUSIONS: A curriculum combining asynchronous web based review content combined with an eight hour on-site simulation based program was deemed to be

highly relevant to practice, appropriate for level of training and approximately the right length for practicing paramedics representing a wide level of experience. Approximately 20% thought the program could be longer. The a large majority of the participants felt the program should be repeated either annually or at 18 months.

P.E. Phrampus, None.

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Education, competency, and assessment

Perceptions of the Debriefing Experience by Paramedic Participants of a Difficult Airway Program

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INTRODUCTION: Debriefings are an integral part of the design of successful simulation based education and/or assessment program. The methods and content of debriefings vary widely. Decisions that impact the debriefing content and style often involve consideration of the intended audience, training of facilitators, available equipment, and amount of time that can be dedicated to a simulation program. Although there is often significant passion, there is little objective data to help with decision making regarding best practices for a globally accepted method of debriefing. We describe the perceptions of the debriefing experience reported by practicing paramedics who participated in a simulation based program.

METHODS: We report on the results of a post-course evaluation survey instrument used to evaluate the advance paramedic airway management (APAM) program conducted at a university-based academic simulation center from July 2007 through December 2008. The program consists of an asynchronous web-based review followed by an eight hour program in a simulation center. The simulation scenarios were based on actual difficult airway cases that occurred in the field and were pre-programmed into the simulators. At the beginning of each scenario the team leader was handed a scenario card that described the scenario, setting, available help as well as approximate distance from a hospital. Simulations utilized the SimMan® high fidelity patient simulator which collects data on simulator physiologic status as well as automated checklist information, and pre-scripted comments entered by the facilitator into a time-stamped log file. Facilitators had all completed a dedicated training program specific for the program. At the conclusion of each simulation the facilitator enters the simulation room and begins a bed-side facilitated discussion with the participant team utilizing the simulator log file as a basic script of the debriefing. There is a projected view of the time-stamped log file, along with easily available reference materials such as graphs, algorithms, diagrams and other training materials. At the end of the program the participants completed a post course web-based evaluation tool consisting of Likert style inquiry and the ability to enter free text responses.

RESULTS: 356 paramedics participated and 334 (94%) completed the on-line post course evaluation. The median years of experience of the participants was 10 (range: 1–34). The Likert items stating “discussion of performance was helpful” was ranked in the top three highest responses by 309 (93%); “debriefing experience allowed me to see my mistakes”, 307 (92%); “debriefing experience allowed me to learn from my mistakes, 309 (93%); “debriefing was completed in a professional, non-personally threatening manner”, 315 (94%). Of 999 total free text comments entered there were no negative comments regarding debriefing and one reflecting positively, 18 reflecting

globally positively on the instructors and 4 with negative comments.

CONCLUSIONS: A debriefing method utilizing a performance summary log file as a general script for a facilitated discussion at the bedside following each simulation scenario was highly regarded and found to be useful. The method was perceived to have been completed in a professional, non-personally threatening manner by a significant majority of participants.

P.E. Phrampus, None.

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Education, competency, and assessment

Combined Boot Camp for Medical and Surgical Interns Using Simulation-based Training and Evaluation

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INTRODUCTION: Medical and surgical residents often begin internship without the necessary prerequisite clinical skills for immediate work with patients. Confidence and quick development of expertise with multiple procedures is required. Typically, residents receive instruction and supervision at bedside during orientation. Simulationbased training and evaluation integrates didactic instruction with hands-on practice, and ultimately provides faculty an opportunity to measure proficiency before patient interactions. Although studies report successful development of specialty specific orientation programs(Esterl 2006, Britt 2007, Pliego 2008, Mikrogianakis 2008), development of an innovative multidisciplinary clinical skills performance assessment has not been described in the peer-reviewed literature. To reduce costs and conserve resources, a large academic medical center developed a multidisciplinary “Boot Camp”. This study aims to determine an intern’s technical abilities and perceived confidence in transferring the principles of effective basic clinical skills to simulated clinical situations and evaluate program effectiveness.

METHODS: A descriptive comparative design was used. Forty-six interns (Surgery/Neurosurgery/Internal Medicine/Family Medicine/Obstetrics) participated in a 5-hour Boot Camp during orientation. Interns received instruction, practiced, and were evaluated on select basic clinical skills. Clinical experts measured intern performance on manikins and models using appropriate checklists. A detailed skill proficiency score was provided, and as well as global score of “demonstrates proficiency” or “requires further practice”. A 5-point likert scale (very low/low/moderate/high/very high) questionnaire asked interns to rate confidence in skills before and after the program. Between- and within-group comparisons were made using Wilcoxon Sign Rank test, and ANOVA with related Scheffe post-hoc tests (alpha_.05). Clinical experts provided evaluative feedback.

RESULTS: Overall, perceived confidence in all areas increased: central line(Z__5.18,p_.001), foley catheter(Z__4.43,p_.001), suture removal (Z__3.77, p_.001), skin stapling(Z__3.56,p_.001), two-handed knot tie(Z__4.66,p_.001), gowning/gloving/draping(Z__4.18,p_.001), peripheral IV(Z__4.66,p_.001), pap smear(Z__4.54,p_.001), pelvic exam(Z__4.68,p_.001), suture identification(Z__3.31,p_.001), wound dressing change(Z__3.28,p_.001), skin staple removal(Z__2.33,p_.020) wound open/close(Z__4.54,p_.001), surgical instrument identification(Z__2.45,p_.014), porta-cath maintenance and access(Z__2.71,p_.007), and abdominal drain removal(Z__2.64,p_.008). Differences

in confidence in suturing, $F(3,38)_3.83, p_.017$, and gowning/gloving/draping, $F(3,38)_4.27, p_.011$, were found between specialties. Post-hoc tests revealed before Boot Camp IM interns were less confident in suturing ($X_3.09, SD_.921$) and FM interns were less confident in gowning/gloving/draping ($X_3.25, SD_1.39$) than Surgery interns ($X_4.22, SD_.97$; $X_4.67, SD_.5$) respectively. However, confidence between groups showed no difference after the program. Interns stated program objectives were met(98%) and recommendation to colleagues(93%). Overall, the majority of interns were proficient in all skills(95%). Further practice was required with wound open/close and central line placement. All experts(4MD/4RN/7allied health) would participate again and found the environment conducive to learning. The majority stated it was one of their most rewarding resident experiences(60%). Scheduling expert attendance was not prohibitive(63%) and the program was worthwhile(94%). Factors that influenced participation were interest in teaching and supporting resident education. Suggestions for improvement: 1)offer the program to PA students, 2)allow more time at stations, and 3)provide refreshments.

DISCUSSION: This original research describes successful integration of early clinical skills assessment across multiple residency programs. This initial study provides a foundation for future research which would gauge an intern's perceived technical abilities and confidence in performing these procedures on actual patients 6 months and 1 year following the combined Boot Camp.

S.L. Ranson, None.

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Education, competency, and assessment

Skill Retention in Critical Event Management One Year Following Simulation-Based Training

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Results in improved performance in simulated scenarios for novice anesthesiology residents as has been previously reported. Improved performance was observed at three weeks with no decay at six weeks, but data regarding longer-term skill retention in anesthesiology residents are needed. The purpose of this study was to compare the performance of anesthesiology residents at six weeks of training versus at one year.

METHODS: Twenty-two residents were eligible, and all participated in this IRB approved study. Residents received focused, simulation-based instruction in critical events during their first six weeks of anesthesiology training and were tested in their management of these events at six weeks. Subjects were subsequently re-evaluated at the end of the first year of training. The test presented scenarios involving three acute intra-operative hypoxemia events (bronchospasm, endobronchial intubation and circuit disconnect) and three hypotension events (hypovolemia, medication error, myocardial ischemia) in random order. Raters blinded to the subject's identity scored residents' performance using validated performance checklists corresponding to each scenario.

RESULTS: Data from 22 subjects were analyzed. Performance was scored as a percentage of correctly completed actions. Scores for the six scenarios were analyzed using the paired t-test. There was no significant difference in performance for hypoxemia scenarios at one year compared to six weeks. However, there was a significant decay in

performance for all three hypotension scenarios at one year (Table 1).

CONCLUSIONS: Simulation-based training of critical events results in improved skill acquisition during the initial training phase of novice anesthesiology residents. While skills at one year were retained for hypoxemia events, the significantly lower scores for hypotensive events suggest that there was decay in skills pertinent to hypotension. This finding highlights an area of potential need for follow-up beyond the initial period of focused training.

M.R. Richert, None.

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Education, competency, and assessment

Effects of Simulated Joint Aspiration Training on Self-Confidence

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INTRODUCTION: Musculoskeletal problems encompass 23% of primary care visits and affect 43 million people in the United States. Arthrocentesis among medical providers is on the decline with 74% practicing this procedure in 1986 compared to 54% in 2006. Many medical training programs require three joint procedures for graduation, a requirement recently recommended by the American Board of Internal Medicine. In the setting of this requirement, only 15% of graduating trainees report confidence with arthrocentesis. Joint aspiration and injection are traditionally taught on an informal basis to medical providers during training. Our objective is to determine if the educational tool of joint simulation for needle aspiration improves self-confidence scores among medical providers.

METHODS: A pre and post elective, anonymous survey was administered to medical providers who attended a one hour joint simulation workshop during a regional American College of Physicians annual scientific meeting. Knee and shoulder simulators were utilized as educational tools. Using a 10-point Likert type scale, respondents indicated their self-confidence in performing needle aspiration of the knee and shoulder. Medicine internists, subspecialists and trainees were surveyed. Data were compared using Wilcoxon rank sum test. The protocol for this study was approved by the department of clinical investigation at our institution.

RESULTS: Twenty-five pre-joint simulation surveys and 23 post-joint simulation surveys were completed. Approximately half of the respondents were internal medicine staff and trainees and the other half encompassing various internal medicine subspecialists. Self-confidence in performing shoulder aspiration pre and post joint simulation improved significantly (mean scores 4.6_2.8 and 7.3_2.0 respectively; p_0.001). Selfconfidence in performing knee aspiration pre and post joint simulation did not improve significantly (mean scores 6.5_3.0 and 8.0_1.6 respectively; p_0.14). The need for additional shoulder simulation training pre and post shoulder joint simulation improved significantly (mean scores 7.9_2.6 and 5.6_2.2 respectively; p_0.001). The need for additional knee simulation training pre and post knee joint simulation training did not improve significantly (mean scores 6.3_3.4 and 4.9_2.4 respectively; p_0.14). All participants scored joint simulation as a useful teaching tool with a mean score of 9.0_.80.

DISCUSSION/CONCLUSIONS: Internists consider joint simulation to be useful and desire further simulation training. Joint simulation builds self-confidence among medical providers and after a one hour simulation workshop many participants desire additional training.

J.R. Roberts, None.

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The Hybrid Use of High-Fidelity Simulation in Advanced Cardiac Life Support (ACLS) Task Training

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INTRODUCTION: The teaching of Advanced Cardiac Life Support (ACLS) is a core competency for all health care providers in the hospital setting. This research was designed to determine the most effective method of teaching ACLS to third year medical students to enhance retention and recall of the complex algorithms embedded in ACLS. The hybrid use of high-fidelity simulators and trained confederates were used to determine if retention were greater than traditional teaching methods of the ACLS protocols.

METHODS: Core competencies were developed by the faculty to include CPR, drug therapy, teamwork, communication and leadership skills. The AHA ACLS course was taught to all 120 third year medical students over a two week course. Practice simulation sessions and final assessments were done on high-fidelity simulators. A follow-up survey was conducted at two months to measure retention of the ACLS guidelines. A post-test was sent out at month six. During month ten, all 120 students completed a year end clinical skills exam with one station designed to retest the student on the ACLS protocol.

RESULTS: Of the 120 third year students who participated in this study, 115 passed the criteria to initially become certified in ACLS. Two months after initial training, a survey evaluation was conducted to determine ACLS guidelines retention. 87% of the students were able to recall basic ACLS guidelines. 70% of the students were able to recall these guidelines six months out with a passable score. During the year end exam, 50% of the students successfully passed the ACLS exam station. It was determined this was a significant retention rate considering the actual practical application the students have. When compared with two previous year's medical student classes, the overall retention of the ACLS algorithms was significantly higher.

CONCLUSION: Opportunities to participate in learning ACLS guidelines abound. Students who participated in this project demonstrated a greater retention of the ACLS guidelines than previous year's medical students who did not work with hybrids utilizing high-fidelity simulators and confederates. Future studies will include a review practice during the emergency medicine rotation to enhance student's retention.

D.M. Schocken, None.

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Communication with Adolescents Regarding Female Health Issues: A Comparison Between Gynecologists and Family Practitioners in a Simulated-Patient Based

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Communication with Adolescents Regarding Female Health Issues: A Comparison Between Gynecologists and Family Practitioners in a Simulated-Patient Based

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BACKGROUND: Simulated-patient (SP) based programs are recognized as an effective educational modality for bridging the gap between theoretical learning and clinical practice. The Israel Center for Medical Simulation (MSR) offers gynecologists and general practitioners the opportunity to enhance their communication skills with adolescent patients.

OBJECTIVE: To compare communication patterns of gynecologists and family practitioners during SP based encounters with adolescent patients presenting with female health issues.

PARTICIPANTS: Two groups _11 board-certified gynecologists (G) and 12 boardcertified family practitioners (FP).

SETTING: A one-day SP-based workshop for each group. In each workshop, 8 scenarios of female adolescents presenting with female health problems were conducted, videotaped, and discussed with an adolescent medicine pediatrician specializing in teaching communication skills with adolescents.

SCENARIOS: Anemia due to dysfunctional uterine bleeding; dyspareunia; emergency contraception; secondary amenorrhea due to pregnancy; physical abuse; first pelvic examination; primary amenorrhea due to eating disorder; explaining pubertal development to a pre-menarcheal adolescent with mental retardation.

ANALYSIS: Video-recorded scenarios were coded by 2 professional coders, using the Roter Interaction Analysis System (RIAS) - one of the most widely used quantitative systems to analyze provider-patient interaction. With this system, each statement was coded into 40 RIAS categories which were assigned to broader groupings, reflecting the main functions of the medical interview: gathering data, patient education and counseling, building a relationship with the patient, and activating and partnering with the patient.

RESULTS: The average number of utterances per interview was 163 for the FP and 104 for the G. The average number of utterances expressed by the SP per interview was 105 and 61 with the FP and with the G respectively. FP used 60% more questions than the G for gathering data, using 2.4 times more open-ended questions and 1.2 times more closed-ended questions. Utterances reflecting patient education and counseling were used in similar frequencies by both FP and G. Utterances expressing building a relationship with the patient and activating and partnering with the patient were used 1.5 and 2.9 more times by FP than by G respectively. Inter-rater reliability was above 0.8 based on Pearson correlation coefficients.

CONCLUSIONS: In a simulated-patient based setting, family practitioners seemed to better communicate with female adolescent patients than gynecologists, as reflected by their gathering information, building relationships, and activating and partnering with the patients, as well as by allowing more opportunities for the patients to express themselves. Similar findings in larger numbers of both groups may indicate a need for training programs for gynecologists that will improve their communication skills with adolescent patients.

O. Shalomson, None.

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Do Gains in Self-Efficacy Translate to Gains in Knowledge in Nursing Students?

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INTRODUCTION: Several small studies have shown improvements in feelings of self-efficacy in both medical and nursing students but have not linked feelings of self-efficacy with clinical knowledge. This study examined the relationship between gains in self-efficacy and clinical management knowledge of heart failure (HF).

METHODS: Following IRB approval at each institution, 162 students (age 25.7_6.6; gender_85.5% female) from 4 nursing schools were studied in groups of 5 at the same point in their curriculum using a HF simulation (Laerdal, New York). Tests included a HF knowledge pre-test with a self-efficacy assessment and parallel post-tests with self-efficacy assessments after specific stages of the HF simulation (given after the hands on [Post-test 1] and another after debriefing [Post-test 2]). The knowledge tests consisted of questions regarding care of an acute HF patient. The Self-efficacy assessment was a Likert-scale format with 12 skill areas pertaining to care of the HF patient (SEHF). Self-efficacy scores ranged from 1 (not at all confident) to 5 (extremely confident). These assessments were applied at the same time points as the HF knowledge tests. Statistical analyses of the knowledge test and the Self-efficacy item “managing a patient with the disease/condition of Heart Failure” included Pearson’s correlation and ANOVA with post hoc T-tests.

RESULTS: Analysis of Knowledge scores post-simulation compared to pre-simulation revealed a mean improvement of 5.6 points ($p_{0.001}$). Pearson’s correlations on the pre-SEHF and pre-test knowledge of HF results revealed a significant negative correlation ($r_{0.162}$, $p_{0.040}$). The first post-SEHF score and Knowledge post-test 1 was NOT significant ($p_{0.991}$) as was the second post-SEHF score and Knowledge posttest 2 ($p_{0.363}$). There were significant changes in self-efficacy scores based upon time of test using ANOVA: the Pre-test SEHF and Post-test 1 SEHF ($p_{0.002}$); Pre-test SEHF and Post-test 2 SEHF ($p_{0.001}$); and Post-test 1 SEHF and Post-test 2 SEHF ($p_{0.006}$).

CONCLUSION: These findings reveal statistically significant improvements in self-efficacy over time during a HF simulation experience for the care of the HF patient but there were no statistically significant positive associations between self-efficacy and HF knowledge among nursing students. It may be that the negative correlation of pre-SEHF and Pre-test for knowledge indicates overconfidence on the part of the student prior to the simulation may contribute to less knowledge regarding HF. These findings call into question whether high subjective feelings of self-efficacy should be a goal of simulation training for student nurses.

M. Shinnick, None.

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Simulation as Process Improvement Tool_ Enhancing Practice via Proficiency Assessment in Central Venous Catheterization

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INTRODUCTION: Physicians place more than 5 million central venous catheters (CVC) annually in the US. Complications associated with CVC are believed to occur in greater than 15% of patients.^{1,2,3} Recognized complications prompted development of a higher standard of training and demonstrated proficiency for individuals performing CVC at Mayo Clinic Florida. We hypothesized that traditionally trained resident physicians perceived to be proficient enough to place CVCs alone or under supervision would consistently pass an endorsed, simulation-based, Central Line Workshop (CLW) CVC proficiency examination, that incorporates endorsed institutional practice standards.

METHODS: Resident physicians engaged in performance of CVCs at Mayo Clinic in Jacksonville, FL were mandated to enroll in the Mayo CLW⁴ which includes online and experiential components. The CLW focuses on training of CVC to demonstrated proficiency standards using ultrasound, universal precautions, and an anatomy-based patient safety curriculum. Experiential training is followed by a “Certification Station” (CS) proficiency assessment. Senior residents and those believed to be adequately proficient (by both program director and self-assessment) in CVC skills were offered the opportunity to “test-out” via CS after performing the online course only, (no experiential component).

RESULTS: 48 residents participated in CLW training including proficiency testing. 21 (44%) were PGY 1, 15 (31%) were PGY 2, 6 (13%) were PGY3, 1 (2%) was PGY 4, 2 (4%) were PGY 5, and 3 (6%) were PGY 6 residents. 29 of 48 (60%) residents completed the hands-on instruction for central venous catheter placement and 28 of the 29 (97%) successfully passed the simulation-based examination on their first attempt. 19 (40%) residents “testing-out” of simulation-based experiential training performed CS following cognitive training. 5 (26%) failed on the first attempt.

DISCUSSION: Traditionally trained resident physicians perceived to be proficient enough to place CVCs alone or under supervision did not consistently pass an endorsed, simulation-based, Central Line Workshop (CLW) CVC proficiency examination, that incorporated endorsed institutional practice standards. This study demonstrates that traditional system assessors of proficiency may be insufficient for optimal patient safety. As a process improvement tool, simulation-based techniques offer the opportunity of assessing the performance of existing systems. In this study, a previously validated system of performance assessment in CVC placement demonstrated imperfect performance by practitioners perceived to be proficient enough to place CVCs alone or under supervision. This exercise demonstrated the weakness of informal CVC placement training exercises and supported the need for standardized experiential training and testing for all residents placing CVCs at Mayo Clinic Florida.

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S.M. Silvers, None.

The Emergency Medicine Comprehensive Assessment (EMCA)**M. Spencer**, L. Spillane, S. Lurie;

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Section 1 - INTRODUCTION: The EMCA is a multi-dimensional OSCE developed to assess overall professional competence encompassing each of the six ACGME core competencies as they relate to graduate medical training in emergency medicine (EM). Phases 2 and 3 of the ACGME Outcome Project require that all residency training programs in the United States develop evaluation processes for the core competencies, begin to collect resident performance data, and use this data to develop a plan for process improvement at the program level. The EMCA was developed in response to these challenges.

Section 2 - METHODS: All EM residents in our training program (36) participated in the EMCA. They were divided into groups of 12, assigned to one of the three assessment days, and excused from their off-service rotations to attend. The OSCE consisted of 11 stations designed to assess clinical skills including communicating bad news, the management of emergency department patients with acute angle closure glaucoma, peri-lunate dislocation, meningitis, and cardiac arrest, ECG/radiograph reading, and technical skills such as splinting, suturing, and intraosseous line placement. There were two standardized patient stations, one mannequin-assisted simulated patient station, one emergency medicine oral board triple case, four procedural skill stations, and three post-encounter exercises consisting of multiple-choice and script concordance questions or task completion exercises. Assessment tools included critical action checklists, global rating scales of performance, task completion checklists, and multiple choice-questions. Tools were completed by trained observers (faculty, standardized patients, and medical students recruited and trained as standardized patients).

Section 3 - RESULTS: Summary scores for each of the stations were calculated and then compared between PGY levels using ANOVA to assess for differences in mean scores. No significant differences in mean scores were found between PGY levels on any of the stations other than the mock oral board station; however we did find some meaningful trends. The PGY3 Total Case Score on all three mock oral board cases was significantly better than those for the PGY1 and PGY2s. Mean scores in ECG reading, radiograph interpretation, and all multiple-choice questions showed a statistically insignificant trend in improvement with increasing PGY level. Performance of ECG and radiograph reading across PGY level was poor and there were some unexpectedly poor individual performances at the splinting and suturing stations.

Section 4 - DISCUSSION/CONCLUSIONS: Although individuals performed variably based on individual knowledge, PGY3s performed better with patient care skills (mock oral boards), and trended towards better performance on medical knowledge skills (ECGs, radiographs, multiple-choice questions). PGY3s performed comparably to the junior residents in communication and professionalism skills, as well as procedurally oriented patient care skills. The EMCA successfully identified individual areas for improvement and the results were used to develop individual learning plans for the residents. It was also valuable in identifying global program deficiencies and to focus curriculum changes. Overall, the EMCA appears to be a valuable tool in the assessment of the ACGME core competencies as they pertain to training in EM and provides useful data on individual and group competency performance.

M. Spencer, None.

Students Experience Positive Emotions More Frequently Than Negative Emotions During Simulations: Contributions to Learning

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INTRODUCTION: Preclinical medical students reported experiencing stress during their encounters with a human patient simulator. There have been few studies, however, that have addressed specific emotions students experience in scenarios using a mannequin. Inasmuch as emotions are related to students' academic achievement, the purpose of this study was to identify the range of emotions experienced by students and analyze these with respect to the level of positive and negative emotions experienced during simulations.

METHODS: Second year medical students completed the Emotional States Assessment Technique after their first simulation and again at the end of their third simulation ($n = 42$). Students reported the percentage of time they experienced emotions associated with anxiety, enthusiasm, dejection, and contentment, and the specific events that caused their emotion(s). The latter were coded using themes identified in their comments. The levels of positive and negative emotions experienced by the students were obtained by taking the sum of the scores along the axis of enthusiasm and contentment, and those along the axis of anxiety and dejection, respectively.

RESULTS: The predominant emotions reported by the students were those associated with enthusiasm. Students reported these emotions 45% \pm 4% (mean \pm SE) and 41% \pm 4% of the time after their first and third encounters, respectively. Specific experiences reported by the students related to the opportunity for them to apply what they have learned, and diagnosing and treating their patient based on data they acquired. Students reported emotions associated with contentment 34% \pm 4% and 43% \pm 4% of the time after their first and third encounters, respectively. The specific experiences reported by the students pertained to the group dynamics and working as a team to help the patient. Students reported emotions associated with anxiety 28% \pm 4% after their first simulation and 21% \pm 4% after their third encounter with the simulator. The predominant experience reported by the students after their first encounter was the uncertainty of what to expect. After their third encounter, the students reported experiences related to their performance in the simulation. Finally, the students spent minimal time experiencing feelings of dejection (14% \pm 3% and 18% \pm 4% after their first and third encounters, respectively). The predominant experiences described by the students were feeling tired and not wanting to make a mistake. The levels of positive and negative emotions were, respectively, 76% \pm 6% and 39% \pm 4% after their first simulation, and 81% \pm 6% and 36% \pm 5% after their second.

DISCUSSION/CONCLUSIONS: The net effects of positive emotions on learning and motivation are positive in most cases. Thus, in addition to the contributory effects of simulation on learning, the data suggest that the students' emotions may contribute as well. The net effects of negative emotions are equivocal, however. Anxiety experienced by the students may be detrimental but this emotion could also enhance their intrinsic motivation to perform better. In general, emotions experienced by students during a scenario with a mannequin contribute to the learning afforded by simulation.

REFERENCES (Optional):

J. Szarek, None.

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Assessing the Perception of Transferability of Simulation Based Learning into Clinical Practice

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INTRODUCTION: Clinical simulation offers a safe environment for healthcare providers to learn and make mistakes without harming patients. Despite benefit of enhanced patient safety resulting from the use of simulation in education, there is little evidence in literature supporting the transferability of skills into clinical practice. The goal of this longitudinal study was to determine whether simulation based learning successfully transfers into clinical practice. Institutional Review Board approval obtained through the University of Pittsburgh.

METHODS: Crisis Team Training (CTT) was utilized to measure transferability of simulation based learning into clinical practice. Interdisciplinary CTT classes, consisting of nurses, respiratory therapists, and physicians (N=154) were conducted using simulation as a teaching strategy. A ten question survey was distributed after initial CTT, and again six months later. T-tests were used to compare results of both groups.

RESULTS: Initial post-education survey revealed participants believed simulation would have a positive effect on their practice. The six month post education survey also revealed participant's (N=68) perceived positive effects from the CTT class. Based on results from the 10 question survey, there was no statistical difference between the initial and six month survey on three questions. However, seven questions indicated statistical differences between the two surveys.

DISCUSSION: Evidence points to simulation as an effective teaching strategy in preparation of healthcare providers. Results indicated simulation based learning pertaining to medical knowledge, judgment skills and Crisis Team duties was sustained over six months. Although there was statistical difference between groups pertaining to confidence, technical skills, communication, team skills, weakness identification, and perceived value of simulation, participants still perceived positive effects from simulation-based learning six months post education. Further research is needed to measure the perceived effect of multiple CTT classes on participant's communication and team skills.

R.A. Tarantine, None.

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Student Satisfaction with Simulation to Support a Second-Year Medical Student Respiratory Disorders Module

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INTRODUCTION: High-fidelity simulations have been mainly designed and utilized for small group teaching. In order to extend this tool to larger groups of students in the first two years of medical school, we modified our simulation facility to provide four simulated cases in support of a traumatic and mechanical disorders module in our

second-year medical student curriculum. The exercise provided all students with hands-on experience as well as an opportunity to observe the simulated encounters conducted by their classmates.

METHODS: We reviewed the results of an anonymous survey completed at the conclusion of a simulation exercise presented to second-year medical students. The exercise was designed to facilitate clinical application of the traumatic and mechanical respiratory disorder module of the respiratory system curriculum. Students completed the sessions in their previously established groups of six students each. Two to four groups participated in each session which consisted of the same four simulation cases (spontaneous pneumothorax, smoke inhalation, aspiration pneumonia, and anaphylaxis with upper airway obstruction). Each group participated in patient evaluation and care during at least one of the four cases and observed the remaining cases from an audiovisual connection in the adjacent classroom. A faculty member served as a facilitator in the laboratory during each case. Five, two-hour, sessions were conducted in one day to accommodate the whole class. Student satisfaction with the simulation format was surveyed with a six-question post-session evaluation using a four-point Likert scale (1-Strongly Disagree; 2-Disagree; 3-Agree; 4-Strongly Agree).

RESULTS: Ninety-three students (86%) completed the survey. The mean scores and 95% confidence intervals (CI) for responses to each question were: 1) The concepts presented in the case scenarios correlated well with basic science concepts presented in class during this part of the curriculum (mean 3.8; 95%CI: 3.7 to 3.9). 2) The use of patient simulations enhanced the presentation of the team based learning exercise (mean 3.9; 95% CI: 3.9 to 4.0). 3) The facilitators were effective in presenting the simulations and clinical scenarios (mean 3.9; 95% CI: 3.8 to 4.0). 4) Participating in these simulation presentations enhanced my understanding of Traumatic and Mechanical Pulmonary Disorders (mean 3.8; 95% CI: 3.7 to 3.9). 5) These simulation exercises are a valuable use of instructional time during the basic science curriculum (mean 3.9; 95% CI: 3.8 to 3.9). 6) These simulation exercises provided a safe environment to practice the clinical application of basic science knowledge (mean 3.9; 95% CI: 3.9 to 4.0). The median score for each of six survey items was 4 indicating strong agreement with each statement.

CONCLUSIONS:

1. Simulation is an effective tool which can provide a safe environment for large groups of medical students to apply basic science principles to clinical scenarios.
2. Large groups of students can have an interactive learning experience with simulation modifications which merge the classroom with the simulation laboratory.

R.P. Ten Eyck, None.

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Multi-manikin Simulation to Assess Mass Casualty Triage Skills in Military Healthcare Providers in Asia Pacific

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INTRODUCTION: More than half of the world's natural and humanitarian disasters occur in Asia Pacific. Military healthcare providers often form a core element of a nation's response to mass casualty situations. A manikin-based triage exercise was created and tested at an international military healthcare conference in Seoul, South Korea.

METHODS: The research protocol was approved by the University of Hawaii Committee on Human Studies. Two 90 minute sessions were conducted, one in English only, and one in English with sequential translation into Korean. Volunteer conference attendees received a brief review of three mass casualty triage algorithms before participating in the exercise. All subjects completed a brief demographic survey and rated their self-confidence in conducting mass casualty triage on a 5-point Likert scale (1_not confident at all to 5_extremely confident). Subjects sequentially triaged five simulated casualties. The clinical scenarios/triage categories were: severe leg wound (hemorrhagic shock/immediate); severe head wound (traumatic brain injury/expectant); limb trauma (leg fracture/delayed); and inhalation injury (airway/immediate). Two manikins had identical manifestations of hemorrhagic shock except for the location of the leg injury. Subjects used a worksheet to record a triage category (minimal, delayed, immediate, or expectant), and a triage score (TS) was calculated as the total number of correct triage responses (maximal possible score _5). Time to Triage (TT) five manikins was recorded for each subject.

RESULTS: 56 subjects were recruited. Countries represented were Korea (44), Japan (3), Malaysia (2), Fiji (1), New Zealand (1), Thailand (1), UK (1), and US (3). Two participants (Korean) did not complete the exercise and were excluded from analysis. Means and 95% confidence intervals were calculated. Average years in clinical practice was 8.5(2.38). Average TT was 171(21.3) sec. TT was not different for subjects with prior training in triage, 169(29.3) sec, versus subjects without prior triage training, 175(27.4) sec, $p = 0.81$. TS was not significantly related to years of clinical experience (5 or more v. less than 5, $p = 0.26$), experience with actual triage (yes or no, $p = 0.71$), or prior training in mass casualty triage (yes or no, $p = 0.83$). However, TS was significantly correlated to initial self-confidence in conducting mass casualty triage ($p = 0.011$). TS for the two identical hemorrhagic shock cases were not correlated ($p = 0.11$).

DISCUSSION/CONCLUSIONS: An array of multiple manikins can be used for training and assessment of large groups of learners. In this cohort of international military healthcare personnel, reported self-confidence was a better predictor of triage skill than history of prior triage training, exposure to actual triage situations, or years of clinical experience. These results are intriguing and should be confirmed with other groups of healthcare providers, in other settings. Mass casualty triage training using multiple manikins may provide organizations with valuable insight into current capabilities and future training needs.

D.S. Vincent, Laerdal Medical, Speaking and Teaching, Consulting Fee.

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Can Medical Students Correctly Identify the Need for Falls

Risk Assessment in the Elderly?

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INTRODUCTION: Falls, Balance, and Gait Disorders is one of the key domains of geriatric competencies recommended for inclusion in medical student education by the Association of American Medical Colleges. To address this competency we have developed an integrated geriatric curriculum for third year medical students, one portion of which teaches a comprehensive falls risk assessment. The falls risk assessment is a robust package of history and physical examination techniques, which allows students to quantify the risk of falls in elderly patients. Students practice the integration of these falls

risk measures as part of the Outpatient Internal Medicine Clerkship (IM) and complete a falls risk Objective Structured Clinical Exam (OSCE) with a geriatric standardized patient (SP) at the completion of the clerkship. Students receive formative feedback on their performance. As a measure of summative performance, we have developed a high stakes Clinical Performance Examination (CPX) patient case utilizing an elderly SP. This case is designed to measure whether students identify the need for and appropriately complete a falls risk assessment.

METHODS: Five older adult standardized patients were recruited to participate in the CPX case. SPs were extensively trained using a detailed training portfolio to portray the case of a hypothetical 75 year old patient who recently fractured her wrist during a fall. In 15 minutes with the patient, the student should assess her to determine her risk for falling, other confounding conditions, and be prepared to make a recommendation to whether the patient can continue living alone. The SPs are trained not only to portray the case but also to assess the students' abilities to elicit a relevant history, perform cognitive and mobility assessments, and demonstrate effective communication skills. The SPs utilize a behaviorally anchored checklist to assess the medical student's performance on all measures. Students are instructed to read an initial information door note defining the patient encounter and perform any needed history and physical examination. At the completion of the examination, students are asked to complete a SOAP note. Outcome measures for successful completion of the case are the ability to identify the patient's risk for future falls, completion of a mobility test, and recognition of alcohol use as a risk factor. The scoring table is standardized so that after limited training, a non-clinician is able to read and score SOAP notes.

RESULTS: Results from 2008 (N=168) demonstrated that 100% of students asked about the original fall, 88.7% asked about other falls, and 89.9% assessed the patient's mobility. A minority of students, 22.6%, correctly identified the confounding falls risk of her alcohol use and recommended a reduction in intake. Most students, 54.2%, correctly recommended she could continue living alone.

CONCLUSIONS: Medical students can successfully perform accurate falls risk assessment in elderly patients. Elderly persons from the community can be successfully trained to perform as standardized patients and provide highly reliable data on student clinical skill acquisition they are an underutilized valuable resource for teaching. Students did not tend to recognize the alcohol risks for the patient.

D. Woodyard, None.

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Education, competency, and assessment

Using High and Low Fidelity Simulation to Teach and Practice Teamwork Training

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INTRODUCTION: Deficits in communication among health team members help to contribute to 70% of sentinel events in the US. Teamwork training has been cited as a mechanism to enhance team communication and mitigate the risk of significant communication errors. For these reasons, teamwork training is increasingly becoming an integral part of health professional education. Using simulation to enhance teamwork training is appealing to educators but establishing effective, efficient interdisciplinary teamwork training is a daunting task. We have conducted simulation based interinstitutional and inter-professional team training, using TeamSTEPPS as the core content,

with medical and nursing students at two major universities. Primary outcomes measured were changes in learners' teamwork attitudes and knowledge.

METHODS: Of 438 senior nursing students and fourth year medical students 160 were randomized to simulation training. All students completed a knowledge and attitudes pre- and post-test and participated in a joint 90-minute didactic lecture on the need for team training and basic concepts from TeamSTEPPS. The simulation cohort (N_160) was randomly divided into either Low Fidelity Simulation using Role Play (N_80) or High Fidelity Simulation using Patient Simulators (N_80). The scenarios used for both high and low fidelity simulation scenarios were identical. Students were divided into teams of four; 2 nursing and 2 medical students per team. We used ten high fidelity simulators (METI's ECS and Laerdal's SimMan) and ten role play groups simultaneously to train the eighty students per cohort in two hours. For both the high and low fidelity simulations, a faculty facilitator guided the scenarios. After each scenario, all students were debriefed using a standard format. The debrief for the high fidelity simulation was conducted using video from the encounter. All faculty facilitators participated in a 90-minute faculty development program, which taught the scenarios, team work skills, and debriefing methods.

RESULTS: Both Role-Play and Simulation teams significantly improved from pretest to posttest (knowledge $F_{19.7}$, $p_{.006}$; attitudes $F_{26.0}$, $p_{.000}$), but there was no significant difference between the two cohorts, (knowledge $F_{.006}$, $p_{.938}$; attitudes $F_{0.779}$, $p_{0.379}$). Both medical and nursing students significantly improved on attitudes and knowledge, with nursing students having greater attitudes pre- and posttest (143.3 and 145.7) versus medical students (139.6 and 143.0), although the difference was not significant. Medical students had greater teamwork knowledge pre- and posttest (9.23 and 10.45) compared to nursing students (9.05 and 10.24), although this difference also was not significant.

CONCLUSIONS: Learning to work together in a team is a necessary experience in health professional education that requires significant time and cost. We have demonstrated that either low or high fidelity simulation is an effective method for reinforcing these concepts and allows students the opportunity to practice teamwork skills in an inter-professional environment. We believe that this intervention is broadly generalizable for other health professional learners and provides a time efficient method to teach and assess team work competence.

D. Woodyard, None.

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Education, competency, and assessment

Starting Early: Teaching Medical Students to Disclose Medical Errors

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PURPOSE: Informing patients of a medical error is a difficult task for which few physicians receive formal training. The purpose of this study was to determine 1) the feasibility of providing a simple educational intervention "HEEAL" in a workshop format to a class of medical students, and 2) to determine if the intervention improved objective measures of error disclosure competence, and student confidence in performing an error disclosure.

METHOD: 77 fourth year medical students were assigned to participate in a 2-hour structured Error Disclosure workshop as part of a fourth year capstone course. The

workshop focused on teaching students to use the mnemonic HEEAL to define a communication guide or framework for the discussion. This HEEAL framework (**H**onesty, **E**mpathy, **E**xplanation, **A**pology, and **L**essen the Chance for Future Errors) offers the provider with a template to insure that all needed actions and communications are completed during the encounter. This template is designed to ensure full disclosure of the error, reassurance, and empathy to the patient. The 90-minute workshop consisted of a brief 30-minute didactic session, a 10-minute small group breakout session, a second 30-minute didactic session and a 20-minute role play exercise. For the assessment of performance, students were randomized to one of two pre test standardized patient (SP) assessment scenarios. At the post test encounter, students completed a second SP assessment with the alternate case (A-B or B-A). Two measures were used to determine intervention efficacy: Pre-intervention to post-intervention change in Competence (scored by the standardized patient) and self-confidence (scored by the individual student). Pre/Post intervention mean scores were calculated for both measures and the difference in mean scores was used to identify performance changes. We used a paired T-test to assess student improvement from pre to post.

RESULTS: 77 fourth year medical students participated in the study. Of these, 71 (92%) had complete pre- and post-training competence data and 61(79%) had complete self-confidence data. For competence items, the mean pre-test score was 49 and the post-test score was 62 for an average improvement of 13 points (P_0.0001). Students' self-confidence data demonstrated an increased from 47 to 57 a ten point increase (P_0.0001).

CONCLUSION: The HEEAL intervention provides an effective and efficient way for medical educators to teach senior medical students how to provide competent error disclosure. Standardized patient methodology provides educators with a mechanism to assess learner competence in acquisition of this important skill.

D. Woodyard, None.

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Education, competency, and assessment

**Simulations for Inter-Disciplinary Education (SIDE) Project:
Teaching the Communication Aspect of Patient Care**

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INTRODUCTION: Optimal patient care requires a multidisciplinary team with effective communication and understanding of other disciplines' roles. However, the majority of the healthcare learners receive their learning experiences within their own health professional school with little interaction among other health professions. Significant barriers to this important learning exist including cost, time, and varying curriculums. As part of our approach to providing inter-professional educational experiences, we piloted an acute simulation using three healthcare disciplines: pharmacy, nursing and medicine.

METHODS: As a pilot study, volunteer faculty from the three health professional schools designed and facilitated the simulation sessions. Fourth year medical, second year nursing, and third year pharmacy students were recruited. All student participants were asked to complete a pre-test (12-item knowledge and 14-item attitudes) and review a 50-minute podcast on TeamSTEPPS. Interdisciplinary teams were constructed to include one student from each discipline. The case scenario was designed around medication interactions in a patient who is decompensating post-op appendectomy.

Each learner was provided with different pieces of information about the patient, and in order to reach the correct solution, needed to work together by sharing the knowledge they each possess. The facilitator played the role of both a frantic parent and the patient's friend, who has information on illicit drug use the night before. In the thirty minute encounter, students needed to include the family/friends to discover that the patient is experiencing serotonin syndrome from a drug-drug interaction after ingesting ecstasy the previous night, St. John's Wort for depression and being given meperidine post-operatively. The simulation is stopped prior to the patient's full arrest. Students were debriefed using their team's video by the facilitator for thirty minutes followed by the post-test. Outcome measures were changes in pre-post knowledge and attitudes test scores and cognitive debrief of faculty regarding the success and usefulness of the project.

RESULTS: Five medical, eleven nursing, and thirteen pharmacy students (Total N_29) volunteered to participate in the project. This provided five groups of students with representation from each discipline. Analysis of the individual performance of the complete groups of students (N_15) demonstrated significant Pre -post improvement in attitudes towards other professions (p_0.05) and knowledge of team behaviors (p_0.009). Debrief of the faculty suggest that all students had several "ah-ha" moments on discovering the actual diagnosis for the patient. One faculty reported that a medical student said, while slapping his hand to the table, "the pharmacy student suggested we speak to the friend three times, and I ignored her because I thought what I was doing for the patient was more pressing, and that's why we missed it!"

CONCLUSIONS: Opportunities for learning side by side with other health disciplines is beneficial to learners. This pilot project demonstrated that interdisciplinary simulations enhance learner attitudes and knowledge of team based behaviors. Limitations, especially the curricular schedules of the schools, highlight the need for senior leadership participation to achieve widespread implementation of inter-professional curricular elements. Faculty and students endorse the utility of such simulations and support more widespread use for interdisciplinary education.

D. Woodyard, None.

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Education, competency, and assessment

Surgical Olympics: A Simulation-Based Strategy to Distinguish Baseline Differences Between IMGs and US Grads

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INTRODUCTION: While International Medical Graduates (IMGs) encompass a significant proportion of American surgical trainees, there has been a perceived notion that their training and skills are inferior to United States (US) Medical School Graduates. These alleged differences, if in fact exist, have never been objectively assessed. We sought to determine the feasibility of a simulation-based testing session (Surgical Olympics) to compare baseline differences between IMGs and US Graduates as new surgical interns.

METHODS: Two consecutive cohorts of General Surgery (GS) interns during their respective first month of training underwent a three-hour competition that involved a series of 12 events based on ACGME core competencies designed to measure technical skills (box trainer, laparoscopic simulator), non-technical skills (operative dictation, obtaining informed consent), and basic surgical knowledge. Criteria were set for "surgical decathletes" to achieve scores from 0–10 points for each event based on preestablished

expert-derived proficiency benchmarks. Technical, non-technical, basic knowledge, and overall mean scores between IMGs and US Grads were compared.

RESULTS: In a two-year period, a total of 33 IMGs and 19 US Graduates in their intern year of a GS residency program participated in our Surgical Olympics. Overall mean scores were higher among US grads than for IMGs (37.9 vs 31.7 $p_{0.05}$). Technical (11.10 vs 10.42) and knowledge scores (6.68 vs 5.36) were comparable among the two groups (p_{NS}). Non-technical scores were higher for US Grads (20.2 vs 15.9 $p_{0.05}$).

DISCUSSION/CONCLUSIONS: While the use of a simulation-based testing scenario in a competitive environment did show differences between our IMGs and US Graduates, most of this difference occurred with non-technical skills in stations where communication in English was important. Recognizing baseline differences between IMGs and US Grads is a crucial first step to improving their surgical training and performance.

REFERENCES (Optional):

B. Zendejas, None.

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Education, competency, and assessment

The Effect of A Simulated-Patient-Based Educational Program on Medical Encounters' Quality at Military Recruitment Centers

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The Effect of a Simulated-Patient-Based Educational Program on Medical Encounters' Quality at Military Recruitment Centers

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PURPOSE: To assess the effect of a simulated-patient-based educational program (SPBEP) on medical encounters' quality at military recruitment centers.

METHODS: Study Design: Adolescent candidates for military service (ACMS) filled a questionnaire upon completion of their pre-military service medical examination. It included questions regarding health topics addressed by the examining physician, the atmosphere during the encounter, and whether any medical information was not reported by the ACMS. Military recruitment centers (MRC) physicians underwent a SPBEP. The same questionnaire was filled by ACMS prior to and 6 months after the educational intervention. Setting: MRC, and a medical simulation center. Participants: 697 and 508 ACMS prior to and following the intervention, respectively, who were examined by 12 MRC physicians. Intervention: The SPBEP included 8 simulated scenarios typical for medical encounters at MRCs. Professional actors role-played the ACMS, while the 12 MRC physicians functioned in their professional role. Following the simulations, an adolescent medicine physician and a senior military physician facilitated a discussion utilizing video recordings of the simulated scenarios. Doctoradolescent communication issues as well as adolescent risk behaviors and psychosocial

problems were specifically emphasized during the debriefing discussion. Outcome measures: The pre and post intervention questionnaires were compared using a Chisquare test.

RESULTS: School problems were addressed by the physicians in 60% of the questionnaires filled by the ACMS pre-intervention, and 69% post-intervention ($p_{0.01}$); unsafe sex in 30% pre and 35% post-intervention ($p_{0.01}$); questions regarding mood in 47% pre and 52% post-intervention ($p_{0.05}$). Cigarette smoking and alcohol use were addressed in 72% and 83% respectively, both pre and post-intervention. Physicians were perceived by the ACMS as interested in them in 68% pre and 78% post-intervention ($p_{0.01}$). Pleasant atmosphere and physicians' clarity of speech tended to increase following the intervention. The percentage of ACMS who admitted the omission of medical information decreased from 6.6% prior to the intervention to 2.4% following the intervention ($p_{0.01}$).

CONCLUSIONS: SPBEP for MRCs' physicians improves the quality of the physician-ACMS encounters, reflected by a significant decrease in omission of medical information, and related, probably, to increase in the physicians' interest in the ACMS personal lives and the more relaxed atmosphere during the encounters. **Sources of**

support: None

A. Ziv, None.

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Emerging and innovative methods and technology

The Mind'S Eye: Psychiatric Elements For Enhancing Simulations

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Although other fields of medicine have engaged in simulation as a teaching method, the field of psychiatry is a discipline that can provide many unique elements for enhancing many forms of simulation across the spectrum of health care. Often psychiatry simulations are linked only with standardized patients and role-play for specific mental health conditions. However, the field of psychiatry has developed advanced techniques for facilitation in terms of interpersonal and intrapersonal dynamic issues, and deals with cognitive and emotional factors that influence perception and behaviour. In other words, the areas of briefing, debriefing, modulating actions, creating psychological fidelity and more are especially relevant for input from psychiatric perspectives. These were the reasons the world's first psychiatric simulation centre was launched as a consultation force not only for the department of psychiatry at the University of Toronto but for all fields of medicine and health care. The presenter will discuss the development of the Psychiatry Simulation Innovation (P.S.I.) Centre at the University of Toronto. This includes the creation of methods whose primary focus is on psychological and psychodynamic elements for simulation excellence. Some of these techniques have been published in academic journals and shared at international conferences. The importance of using cognitive and emotional elements to address attitudinal educational issues is highlighted. A major goal of the centre is to better understand, prevent and treat mental health issues and associated issues. These innovative simulation elements can be used to understanding people's perspectives i.e. not only in terms of psychiatric conditions, but other professionals' points of view, deal with grey areas of overlapped responsibilities, and developing teamwork excellence. In other terms, creating simulations for developing healthy professional attitudes and destigmatizing / removing stereotypes associated with various professions. Interprofessional issues can

be quite complex, with many possible concurrent personal, team, and institutional / broader situational factors. As part of the presentation, the presenter will demonstrate various methods for simulations developed through the centre that draw upon fundamental learning theories that involve cognition and emotion, as well as specific examples that have been used for the development of various projects, including the development of Alzheimer's disease programs, anti-stigma presentations, organ-donation education, ICU delirium interprofessional initiatives, and more.

B. Ballon, None.

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Emerging and innovative methods and technology

Testing the Face and Content Validity of a Transcervical and Transabdominal Chorionic Villus Sampling Model

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INTRODUCTION: Learning the basic skills for performing chorionic villus sampling (CVS) techniques is difficult as no models for training exist. Experience is generally obtained on 25–50 non-continuing pregnancies prior to termination. Additionally, some learners chose not to learn this procedure secondary to ethical considerations. This type of training is difficult to coordinate and assure performance of enough supervised procedures during the course of a fellowship in Maternal Fetal Medicine. Because of these limitations, only 1/3 of fellows leaving training have performed CVS in a clinical setting and the majority of these trainees do not have enough experience to have reached a level of competency. In order to enhance training while providing improved opportunity for demonstrated proficiency, we developed and tested a lowcost model to practice transcervical and transabdominal CVS.

METHODS: A hands-on demonstration workshop for ultrasound guided needle procedures was given at the Annual Meeting for the Society of Maternal Fetal Medicine. Participants engaged in eight clinical stations in performance of genetic amniocentesis, transabdominal and transcervical CVS, and in-utero stent placement. Participants completed pre- and post- workshop questionnaires assessing demographics, experience, and model evaluation.

RESULTS: Following the personal use of the transabdominal CVS model, 87% (20/23) of attending physicians and 86% (7/8) of MFM fellows described appropriate realism when viewed sonographically. 77% (17/22) of attending physicians and 88% (7/8) of MFM fellows described appropriate realism of tissue resistance during the procedure. Following the personal use of the transcervical CVS model, 96% (20/23) of attending physicians and 86% (6/7) of MFM fellows described appropriate realism when viewed sonographically. 89% (17/19) of attending physicians and 86% (6/7) of MFM fellows described appropriate realism of tissue resistance during the procedure. One hundred percent of attendees agreed that these models would enhance the current methods of CVS training. Eighty-three percent (19/23) of faculty and 100% (7/7) of MFM fellows responded that they would personally make these models for use as practice or to teach fellows/staff. Seventy-seven percent (17/22) of faculty and 86% (6/7) of MFM fellows responded that they would purchase such a model if commercially available.

DISCUSSION/CONCLUSIONS: The transabdominal and transcervical chorionic villus sampling models appear to have good face and content validity. These tools will be a valuable adjunct to facilitate training in these ultrasound guided needle procedures.

REFERENCES (Optional):

B.C. Brost, None.

Emerging and innovative methods and technology

Development and Implementation of an Internet-Based Research Portal for the Management, Facilitation and Analysis of Simulation-Based Research

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INTRODUCTION: Despite the widespread use of Learning Management Systems (LMS) across educational institutions, no LMS system to date has been equipped with research-based functionality (1,2). To address this issue, we have developed a universally applicable LMS-based research portal specifically designed to manage and facilitate simulation-based research projects. Currently, this research portal is being used to manage and synthesize data collected from 14 hospitals as part of the EXPRESS (Examining Pediatric Resuscitation Education using Simulation and Scripting) pediatric research trial.

METHODS: A needs assessment was conducted via focus group from members of the EXPRESS research collaborative. The needs assessment helped us to determine what functionality the research portal would require, and how the research portal should be designed to accommodate the logistical needs of a large, multicenter research trial. Following this, a small working group comprised of the 3 investigators : 2 simulation researchers (Cheng, Qayumi) and one information technology expert (Tredwell) met several times over 4 weeks to determine how the portal could be designed to make it universally applicable to the greater simulation research community. Once designed, the research portal was pilot tested for 1 month before implementation as part of the EXPRESS research study. Research ethics board approval was not applicable for this project.

RESULTS: We have developed a widely applicable and adaptable research portal dedicated to the creation, management and distribution of information for simulationbased research studies. This application helps researchers design their project, setup and manage data collection, and finally, allow for upload and review of videos, images and other assets. Researchers can use the portal to design their project online, with assignment of subject codes and randomization of subjects to be carried out by the portal in an automated fashion. Additionally, the system allows for data collection to be conducted and distributed based on specified study requirements. Data collected by the research portal is then downloadable in excel spreadsheet format for statistical analysis. Lastly, as studies in simulation may require subjective performance evaluation, the system is designed to accommodate the uploading of video, which can then be attached to data collection tools and distributed online for video review. This resource is currently being used successfully by the EXPRESS research collaborative for their first multi-center simulation-based research trial.

CONCLUSION: We believe that this universally applicable and adaptable research portal will help novice and expert researchers carry out their projects by facilitating the research process, and in turn, helping to advance the field of simulation worldwide.

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Emerging and innovative methods and technology

Simulation Modeling of Healthcare Delivery During Sepsis

Resuscitation

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INTRODUCTION: Delayed resuscitation of severe sepsis and shock (“failure to rescue”) is the key determinant of poor sepsis outcome and enormous associated costs. Complex Intensive Care Unit (ICU) processes and faulty healthcare delivery limit timely and efficient implementation of early goal directed resuscitation. A multidisciplinary team of physicians, researchers and engineering experts is utilizing a “systems engineering” approach to understand and optimize sepsis resuscitation in the ICU setting.

METHODS: In order to define and analyze relevant details of sepsis resuscitation processes and poorly understood structural elements of our hospital environment (“system”), performance functions of sepsis resuscitation system were identified by drawing a “system block diagram” of patient chronology movement during sepsis care, with multidisciplinary input. Then, the “system operation profile” was assessed by collecting critical activities and entity variables from electronic medical records, direct observation and estimation by healthcare providers. Modeling software (Process Simulator, ProModel Corp, Orem, UT) was used for creating a model based on the process flow from the system block diagram. The primary outcome was defined as the time interval between sepsis onset and the time when the sepsis resuscitation goal is reached (central venous oxygen saturation_70%). To validate the model, we compared the average patient cycle time in the summary statistics of the discrete event simulation model vs. summary statistics from the clinical database.

RESULTS: Key system components were: 1) different entities (patients) utilizing 2) resources (providers) to complete defined 3) activities (procedures) in 4) certain time periods. Entities and resources were assigned different variables/attributes (three patients/

day, nurse availability of 30% during evening shifts, etc.). The interaction of these entities and resources as they perform their various functions allowed for understanding global system behavior and construction of “if _ then” logic models within the prototype testing environment. Model verification continued as more tests were performed and errors identified with corrections being made to the model during each iteration. The average accuracy of intervention durations was within 15% of those recorded in the clinical database.

DISCUSSION: Discrete event simulation modeling provides highly detailed, flexible, distributed simulation capacity designed to resolve system issues responsible for critical delays in sepsis resuscitation. The ICU environment lends itself well to process (and clinical outcome) improvement via process engineering principles. This approach may enable future process optimization projects related to other time-dependent critical care processes.

Y. Dong, None.

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Emerging and innovative methods and technology

Discrete Event Simulation of Central Line Catheterization

Process during Sepsis Resuscitation in the Intensive Care Unit

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BACKGROUND: Sepsis related survival is directly correlated with timeliness of intravascular volume resuscitation and antibiotic administration. Central venous catheterization (CVC) is therefore one of the key steps of successful timely resuscitation of severe sepsis and septic shock. Confirming the catheter location by chest X-ray (CXR) is considered a standard of care but also creates inevitable (and variable) delay. This delay could further impact both the subsequent central venous pressure (CVP) targeted volume resuscitation, and other critical aspects of management. In emergency situations, physicians could bypass CXR by using CVP waveform analysis to confirm catheter location, facilitating volume resuscitation. Our hypothesis is that starting fluid resuscitation based on CVP waveform analysis, rather than CXR, could reduce resuscitation delay.

METHOD: Discrete event simulation was used for modeling the CVC process during sepsis resuscitation. In the model, patients with sepsis were admitted to ICU at a rate of 3 patients per day. The average central line procedure time and staff availability were estimated based on observation and internal quality improvement reports. We compared time to start fluid resuscitation between two scenarios: obtaining the CXR before or after volume resuscitation. One year of sepsis resuscitations in ICU were modeled with 5 replications.

RESULTS: Goal directed fluid resuscitation based on CVP waveform analysis, without waiting for CXR confirmation of the CVC location could reduce time to start fluid

resuscitation by averages of 17 min or 27 min (with 50% or 30% radiology tech availability and 100% fellow availability), and by 35 min (with 30% radiology tech availability combined with 30% fellow availability, with 5 minute assumed average fellow delay).

DISCUSSION: This model suggests that utilizing confirmatory waveform analysis rather than CXR to confirm CVC adequacy would be expected to reduce the delay of resuscitation for sepsis patients, with likely survival impact. Simulation modeling provides a safe and efficient environment to test quality improvement and process reengineering before implementation of such changes in the acute care setting; subsequent mannequin-based simulation will further facilitate clinical implementation processes.

Y. Dong, None.

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Emerging and innovative methods and technology

Testing Automated Hand Hygiene Surveillance in a Simulated Environment

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INTRODUCTION: Adherence to hand hygiene guidelines is the most effective way to prevent healthcare-associated infections, particularly in units with low compliance and where patient vulnerability tends to be highest. However, assessing hand hygiene practice can be complex, and there is little consensus in the literature on the most effective measurement methods. Observing healthcare workers' (HCW) adherence to hand hygiene guidelines is considered the "gold standard" by the World Health Organization.

But its wide implementation is not practical because direct observation is costly and labor-intensive, alters the behavior of staff members being observed (Hawthorne effect), and compromises patient privacy. To address the limitations, we have designed and piloted a computerized surveillance system that identifies and pinpoints the location of HCW through infrared (IR) and radio-frequency (RF) technology, monitors their hand hygiene compliance (HHC), and alerts them when there is a lapse in compliance.

METHODS: A complete replica of a patient hospital room was built in a simulated environment to develop and test a system for monitoring and ensuring HHC. The system was designed as follows: aHCW is sensed entering a patient's room and checked against a database of staff required to wash their hands upon entering a patient's room. If theHCW approaches the room's sink or alcohol hand rub dispenser,HCWID badge is sensed in that zone. As HCW uses the soap or alcohol hand rub dispenser, a signal is transmitted to the tracking software to monitor the time spent in the sink or alcohol hand rub zone and records the information to the "hand washing" event manager. If the HCW enters the patient's room and goes directly to the bedside, HCW is sensed in the "patient bed" zone. The rules engine notes that the HCW has yet to wash their hands and sends an alert and updates the "hand washing" event manager. If HHC is not met, an audible alert "Please wash your hands" is activated. The "hand washing" event manager also records theHCWactions or lack thereof upon leaving the patient's room.

RESULTS: A focus group ofHCWtested the system with either a standardized patient or a patient simulator occupying the patient bed. Each event consisted of aHCWeither using the alcohol hand rub or soap dispenser (complying with hand hygiene), or passing both dispensers prompting the system to generate a reminder to wash hands. This strategy allowed us to minimize the number of false positives (system records hand washing when none actually occurred) and false negatives (system fails to record proper

HHC). Data and detailed analysis will be presented at IMSH.

DISCUSSION/CONCLUSIONS: This surveillance system provides an effort-free method to improve HHC and to track improvements of necessary interventions. Furthermore, simulation offers a convenient environment for fine-tuning the features of this novel technological solution.

REFERENCES (Optional):

R. Everett-Thomas, None.

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Emerging and innovative methods and technology

**An Expert Systems-based Virtual Patient Simulation System
for Assessing and Mentoring Clinician Decision Making:**

Acceptance, Reach and Outcomes

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INTRODUCTION: Traditional clinical training methods are expensive and nonstandardized, remove clinicians from the practice setting, and impact is difficult to measure. We report on user performance with an interactive web-based simulation and data analysis program in which practitioners have managed hundreds of virtual patients with vast arrays of medical conditions.

METHODS: Using an interactive virtual medical records interface, clinicians receive electronic mentoring and testing (dual mode) by reviewing histories, ordering tests, making diagnoses among hundreds of choices, and choosing treatments from more than 1,000 medications and other therapies. The simulations can allow or hide in-session diagnostic and therapeutic information which is produced by an expert system-based artificial intelligence engine (A.I.). The A.I. provides guidelines and evidence-based feedback on the appropriateness of choices. Finally, the simulation shows an explanation of reasonable choices for the case, a mini-review of the general topic, and the user's errors, warnings and deviations from guideline, evidence and expert consensus-driven recommendations. All choices are recorded for analysis. This paper summarizes 5-year results from 422 cases from 81 CME programs involving 41 medical conditions and appearing in a variety of internet and hospital venues.

RESULTS: *Usage*—122,990 registered users representing 200 countries have attempted 402,508 sessions with a completion rate of 49%. Of the approximately 5 million page views, the average user viewed 71 pages (31 pages/session) and spent 18 minutes/case. *Errors*—The average score was 60 points (of 100), and 66% scored 80 points. Fewer errors occurred with testing, while there was an increased number of therapy-related errors made by users failing to diagnose appropriately. *Outcomes*—Using an analysis of a neurology program involving 1,946 users and 2,642 sessions, all clinical guidance was turned off for 100 sessions in each of 3 patient simulation cases. Success in making a difficult diagnosis increased from 12% to 36% with guidance operative, an incorrect diagnosis was avoided in 74% with guidance vs. 48% without, and appropriate treatment was more likely with guidance turned on: 74% vs. 44%, 67% vs. 52%, and 42% vs. 23%. User satisfaction remains positive for most users, including average scores of 4.2 of 5.0 using various questionnaires. In 5 HIV training simulation deployments during 2006–2007 in 3 African countries using WHO guidelines and involving 2,780 pre-/post-test simulations, 241 clinicians passed 71% of pre-tests. After clinical feedback was activated, scores increased by 35 points, resulting in a final pass rate of 93% ($p < 0.001$ vs. pre-). Similar improvements were noted in 3 separate programs at 80 hospital sites in 2008 and 2009, the latter utilizing a competency-based model, which eliminated the need for formal post-testing.

DISCUSSION/CONCLUSIONS: Expert systems-based virtual patient simulation shows promise as a mechanism for assessing practitioner skill, detecting skill gaps and for electronic mentoring. These systems have the ability to extend the patient simulation process into chronic and infectious disease states, an area that has been primarily overlooked by mannequin-based simulators.

REFERENCES (Optional):

D.D. Hadden, TheraSim, Inc., Employment, Salary; TheraSim, Inc., Employment, Ownership Interest/Stocks.

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Emerging and innovative methods and technology

A New Simulation Model for Skin Abscess Identification and Management

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INTRODUCTION: Cutaneous abscesses are common and abscess identification with incision and drainage is a curative procedure for which many physicians must develop competence during their training. While medical simulation models can enable proficiency in such skills, current abscess models described in the literature suffer from limitations. The author presents a novel abscess management training simulator evaluated by physicians.

METHODS: The study was granted exemption from continuing review by our study site institutional review board. To create the simulator, mock purulent material is injected into an artificial “abscess wall” that has been tunneled near the surface of a chicken breast. The simulation model was evaluated by 20 physicians familiar with abscess identification and management. Evaluators assessed the model and answered two closed-ended questions regarding the model with an opportunity for open-ended feedback. Physicians were then shown an ultrasound image of the simulated abscess along with two real abscesses and evaluated the sonographic fidelity of the ultrasound model via a closed ended question.

RESULTS: All 20 physician evaluators both agreed that an abscess simulator model would be a useful teaching tool and that this particular abscess model would be a useful teaching tool. Evaluators commented on the excellent realism of the model and also the limitation from an absence of purulent loculations. When evaluators responded to the question “The ultrasound image of the simulated abscess appears realistic,” 10% of individuals “strongly agreed” and 90% of individuals “agreed” with the statement (n_20).

CONCLUSIONS: This new simulation model is simple and realistic and may be an effective tool to teach skin abscess management. Physicians who evaluated the simulated abscess found that it replicates the classic palpable fluctuance and ultrasound findings of an actual abscess and can be surgically incised and drained in a similar fashion. While physician agreed that this model would be useful, future studies may validate this task trainer as an effective teaching tool.

J.D. Heiner, None.

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Emerging and innovative methods and technology

Experience with a Simulation Model for the Ultrasound Diagnosis of Long Bone Fractures

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INTRODUCTION: Portable ultrasound has emerged as a tool for the bedside diagnosis of skeletal fractures. The ability to use ultrasound to identify fractures increases with time and practice. Medical simulation models can provide known pathology and allow such training without placing patients at risk for discomfort or harm. We recently described a novel trainer for the ultrasound identification of long bone fractures. In this study we evaluated the use of this model within and across several different groups of medical providers.

METHODS: The model is composed of a bare turkey bone housed in a shallow plastic container within an opaque gelatin matrix. Five fracture patterns were created: no fracture, transverse fracture, oblique fracture, segmental fracture, and comminuted fracture. After study site institutional review board review and approval, four different groups sonographically evaluated the models with a SonoSite M-Turbo portable ultrasound device for the presence or absence of a fracture. Physicians, nurses, emergency medical technicians (EMTs), and Army Special Forces Medics (SF Medics) made up the four groups.

RESULTS: A total of 100 individuals assessed all five fracture models (n_30 for the physician and nurse groups; n_20 for the EMT and SF Medic groups). All groups were able to correctly identify the presence or absence of a fractured model with a high degree of sensitivity (range 98% to 100%) and specificity (range 90% to 97%). Overall accuracy across all groups was 98% with no significant difference between the four groups (p_0.05).

CONCLUSIONS: Physicians, nurses, EMTs and SF Medics were all able to use a portable ultrasound device to correctly detect the presence or absence of simulated long bone fractures with a high degree of sensitivity and specificity. The detection accuracy did not vary significantly between groups despite the differing degrees of previous ultrasound exposure and formal training. Future studies are needed to evaluate the potential clinical impact of this trainer.

J.D. Heiner, None.

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Emerging and innovative methods and technology

Outcomes of Integrating Hybrid Simulations in to an Objective Structured Clinical Examination

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INTRODUCTION: Utilizing standardized patients to mimic a variety of patient conditions is standard practice in many medical schools throughout the country. A chief limitation of using standardized patients is that the physiology mimicked during a scenario is limited to the physiology of the standardized patient. At the Florida State University College of Medicine, a hybrid approach to standardized patient use involving high-fidelity simulation mannequins and human actors has been utilized to address this limitation.

METHODS: This study involved 93 third-year medical students with similar educational backgrounds and learner experiences, exposed to two types of simulated learning

conditions. Students were evaluated during the objective structured clinical examination (OSCE) using an assessment checklist covering 38 different areas of performance that was developed by the Florida State University College of Medicine. The hybrid simulation condition used a high-fidelity simulator and a standardized patient concurrently, and the standard simulation condition utilized the standardized patient and preprinted cards with physiologic examination findings printed on them. The students rotated through eight stations that simulated an examination room with a standardized patient, who complained of a particular set of symptoms. In the hybrid simulation condition, the medical student completed the patient's focused history with the standardized patient then moved to a high-fidelity mannequin where the specific physiologic symptoms were mimicked. This allowed the medical student to continue their assessment and ask questions of the patient portrayed by the standardized patient, while they were able to observe the physiologic changes on the simulator. This hybrid simulation condition was compared to the standard simulation condition, in which medical students interviewed the standardized patients, were given a preprinted card with physiologic findings listed on it, and completed their examination using the information from these cards.

RESULTS: Students demonstrated significantly better learning outcomes for multiple tasks in the hybrid simulation condition when compared to outcomes in the standard simulation condition alone. Significant improvements were observed on several assessments including consistent communication between patient and caregiver throughout the encounter, which improved from 65% to 97% ($p_{0.01}$). Performance on questions related to specific symptoms following physical examination also significantly improved from 48% to 97% ($p_{0.01}$). Tasks related to performing the physical assessment were also significantly improved in the hybrid group of participants from 69% to 97% ($p_{0.01}$). However not all performance areas showed a significant improvement in the hybrid simulation condition, specifically in areas covering patient hypothesis of theory or cause of illness were reduced from 67% to 42% ($p_{0.01}$).

DISCUSSION/CONCLUSIONS: The OSCE utilizing high-fidelity simulations resulted in higher performance by the medical students in several areas. Areas such as physical patient assessment and communication were shown to have significant improvement. In contrast areas such as patient interviewed hypothesis of disease theory or cause was demonstrated to have a decrease in performance. Further research is needed to determine if the performance of medical students during an OSCE can be improved utilized hybrid simulations involving high-fidelity simulations and standardized patients versus utilizing standardized patients alone.

REFERENCES (Optional):

C. Jackson, None.

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Emerging and innovative methods and technology

Teaching Cranial Nerve Examination Using a Virtual Patient and the Nintendo Wiimote_: Preliminary Evaluation

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INTRODUCTION: Teaching students how to recognize rare neurological deficits during a cranial nerve examination is challenging. In this pilot study, we tested the face

validity of an innovative tool called NERVE (the neurological examination rehearsal virtual environment), created at the University of Florida. NERVE simulates a life-size virtual patient that can be examined using speech recognition and a Nintendo Wiimote®. The Wiimote® serves as a virtual hand, ophthalmoscope, and eyechart.

METHODS: Following IRB approval and informed consent, 5 clinicians, 6 residents, and 5 medical students from the Medical College of Georgia performed a cranial nerve examination (excluding nerves I, V, and VIII) on a VP with a nerve III impairment. Additionally, the 5 medical students also used a web-based simulator, the UC-Davis Eye Simulator 2.0™ for comparison purposes. A pre-experience survey assessed demographics, neurology experience, and video-game experience. A post-experience survey assessed three constructs: the fidelity of the VP, the educational value of NERVE, and the usability of the Wiimote®. The medical student group also provided an overall rating of both NERVE and the UC-Davis Eye Simulator™.

RESULTS: A multivariable ANOVA conducted between groups did not find any effects of group. A repeated measures ANOVA conducted for the student group between NERVE and Eye Simulator ratings also did not find a significant effect. For NERVE educational value, we used a scale of 1 (strongly disagree) to 4 (strongly agree). Students, residents, and clinicians gave an average rating (standard deviation) of 2.9 (.92), 3.0 (.72), and 2.8 (.44), respectively.

DISCUSSION/CONCLUSIONS: Trends indicate that clinicians were in general more critical of NERVE. Additionally, overall opinion tended towards agreement that NERVE had educational value. Today's computer-savvy learners respond favorably to technology-enhanced learning environments. NERVE shows strong face-validity towards teaching students to recognize abnormal neurological conditions that are difficult to simulate using human actors.

C. Kalaria, None.

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Emerging and innovative methods and technology

Distributed Simulation - Widening Access to Simulation

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INTRODUCTION: The apprentice modelled experiential learning design summarised by 'see one, do one, teach one' is no longer considered optimal in medical education. Simulation has the potential to address many limitations of traditional training without jeopardising patient safety. Despite simulation becoming a mainstream method of education, barriers exist to its widespread use. We have developed 'Distributed Simulation' (DS)- an inexpensive, portable environment to meet some of these challenges.

METHODS: The final DS environment was arrived at through dynamic testing of face validity using 12 surgeons with a range of operative experience. Surgeons were asked to perform a laparoscopic cholecystectomy within the DS environment. Stage 1 consisted of six surgeons whose feedback we used to then significantly change the environment. The second stage consisted of an evaluation of the altered environment with a further six surgeons. Surgeons completed a questionnaire and semi-structured interview after completion. Two psychologists coded interviews independently. Quantitative data were analysed using descriptive statistics.

RESULTS: Total set up time of the simulation environment using two people is less than one hour and total cost is

CONCLUSION: At a fraction of the cost of static dedicated facilities DS provides a high degree of realism that is portable and easy to assemble. The DS environment represents a fundamental development in simulation technology and has the potential of bringing simulation to a wider user group. Validity studies are well advanced and the feasibility of using DS in a number of other clinical scenarios is being investigated.

D. King, None.

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Emerging and innovative methods and technology

Medical Simulation Scenario Visualization with a Graphic Diagram Representation System

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INTRODUCTION: The widespread use and ever-increasing varieties of medical simulation call for accessible, intuitive and informative methods of representing the material content, environmental context and additional details necessary for its effective application and continued advancement. Complementing existing methods of narrative description and manikin programming models, a system of simple diagrams to convey essential elements of acute care simulation scenarios is presented.

METHODS: Three primary elements of acute care simulations are addressed by independent modules of the Simulation Graphic Diagram Representation System (SGDRS):

1. Simulated patient(s) clinical status_progression(s) over time are represented through a 2-axis graphic. The horizontal axis is a visual analog of illness severity, with the left side representing higher morbidity and mortality, and rightward motion indicating clinical improvement; the vertical axis reflects passage of time, starting at the top. Consistency of diagrammatic representation is attained through objects based on flowdiagrams (e.g., rounded rectangle(s) for patient(s), diamonds for decision points).

Greyscale-/color-shading and line characteristics can differentiate between multiple patients.

2. Facilitator(s) roles_interactions are diagrammed with an icon-based representation of patient simulators (e.g., standardized patient, manikin system), simulation controllers (i.e., manikin operator, simulation exercise director), facilitators and participants.

Interactive relationships between groups are depicted with connecting lines (arrowed for directional interactions).

3. Environment map employing icons shows spatial layout and specific locations of simulated patients, equipment and additional elements to be replicated during scenario.

RESULTS: Single- and multi-patient scenarios involving mixed-fidelity patient simulators, actors and educators have been successfully diagrammed for various educational, assessment and research programs. SGDRS has facilitated several aspects of operations through standardization and enhanced collaborative opportunities during scenario development, course preparation, session conduct and debriefing.

DISCUSSION/CONCLUSIONS: A set of graphic diagrams to represent several key aspects of simulation scenarios is presented. Augmentation, revision, dissemination and adoption of the proposed system or similar efforts may allow for improvements in ongoing and future simulation efforts.

L. Kobayashi, None.

Virtual Infant Patients, Families, and Staff Collaboration: Simulating Situational Medical Scenarios with a Virtual Living World

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INTRODUCTION: Medical training simulations mirroring the immersive environment of commercial video games offer benefits superior to physical mannequins. These include the ability to quickly and accurately produce numerous low-volume/high-risk medical situations, the opportunity to practice frequently and obtain feedback privately in a variety of situations and the potential to virtually encounter different patient, family and staff behaviors and cultures. We have created a new type of virtual training, driven by behavior and cultural models. We have developed a recursive platform for the development and visualization of dynamic socio-cultural models in medical situations. The model integrates visualization, sound design, and behavioral/cultural modeling with recursive assessment tools to create a *living world* that is sensory and culturally realistic. Key elements of the living world are the virtual infant patient, the virtual family and the virtual staff.

METHODS: The test scenario for the *living world* construct presents the trainee with two 24-day-old Hispanic neonatal patients, one male and one female, to monitor in NICU beds in adjoining rooms. Both patients initially have as normal stable physical exam. Over the course of the demo, one or both patients decompensate, one from respiratory distress, and the other septic shock. Within the *living world* construct the trainee will provide care that requires assessments of patient condition and implementation of procedures/intervention; all delivered within optimum time frames. Importantly, the trainee simultaneously deals with a variety of less tangible factors, such as cultural differences with the patients' families, doctors with different work styles and personalities, less-than-ideal hospital environments, timing, and general distraction under pressure. The patient outcome is dependent on the trainee's successful dealings with the patient's medical condition in a timely manner and all of the behavioral and cultural issues presented in the *living world*.

RESULTS: The same demo trains general RNs and NNPs. As the severity of each patient's illness escalates, the challenge for each trainee will be different. Nursing trainees will need to focus on monitoring vital signs, recognizing when a patient has become unstable by changes in the patient's vital signs and/or the physical exam, and knowing when to call in a doctor or NP. Nurse practitioners will need to address specific procedures, diagnostic data and/or medications to help each patient at later stages of illness progression. The trainer ends with an in-depth assessment of the trainee's actions, including a root cause analysis of failure and sentinel event recreation. Eventually, multiple kinds of distress, patient age groups, and so on will be variable.

DISCUSSION/CONCLUSIONS: Our medical training *living world* acts very closely to the environment it represents incorporating realistic complexities here-tofore not found in 3-D simulations. Further, the *living world* simulates patient outcomes based on the variables within the virtual environment, such as level of team collaboration, proper utilization and availability of experts, level of family cooperation and inherent cultural practices and informed decision-making. The *living world* construct is a promising technology that incorporates physical, cultural and behavioral modeling to substantially raise the bar on the level of realism in medical simulations.

REFERENCES (Optional):

J.L. LeFlore, None.

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Emerging and innovative methods and technology

Evaluation of Respiratory Mechanics on the METI ECS, METI HPS, and Laerdal SimMan Full-Scale Simulator Mannequins

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AUSTRALIA, ³Royal Adelaide Hospital, Adelaide, AUSTRALIA.

INTRODUCTION: Simulations often require participants to provide respiratory support, but there is little research on the fidelity of respiratory mechanics in full-scale simulator mannequins.

METHODS: Respiratory parameters were measured on three intubated, mechanically-ventilated simulators. Independent variables were Simulator (METI ECS, METI HPS, Laerdal SimMan) and Tidal Volume (200, 500, 800 mL). Dependent variables were: a) delay between the start of inspiration and chest rise, b) delay between expiration and chest fall, c) degree of chest rise, d) lung compliance, e) airflow resistance, and f) “apparent” leak. Mannequins were ventilated at 10 bpm for 10 breaths using a Datex AS/3 anesthesia machine. Data was recorded on video and with a Respironics NICO®2 respiratory monitor and analyzed using repeated-measures ANOVAs.

RESULTS: There were significant effects of Simulator and Tidal Volume for all dependent variables ($p < 0.001$). There was a significant delay between the start of inspiration/expiration and chest rise/fall on the HPS, but not with ECS and SimMan. The height of the chest rise increased as the tidal volume increased on ECS and SimMan, but not on HPS. The compliance and resistance values measured on the HPS were within normal ranges of healthy adult patients, but ECS and SimMan had a substantially lower compliance and higher resistance. The HPS had a relatively constant leak and the ECS’ leaks increased with tidal volume, whereas the SimMan’s leak decreased as tidal volume increased.

CONCLUSIONS: Abnormal chest expansion on the HPS may cause confusion or misdiagnoses during clinical assessment of ventilation adequacy. ECS and SimMan’s low compliance and high resistance may be misdiagnosed or trigger “false” alarms, but they may be more suitable for scenarios incorporating bag ventilation and minimal respiratory monitoring. HPS may perform better with modern ventilators. However, problems will be encountered with all three mannequins when transitioning from bag ventilation to mechanical ventilation.

D. Liu, None.

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Emerging and innovative methods and technology

Utilizing Anatomic Tissue as a Human Simulator: Use of Preserved Fetal Pigs for Simulated Prenatal Assessment

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INTRODUCTION: No low cost high fidelity teaching model exists to assist the learner with the skill and confidence needed to perform a normal basic obstetric ultrasound.

We report a unique, realistic sonographic model and curriculum to teach fetal biometry, amniotic fluid assessment, fetal presentation and evaluation of basic fetal anatomy

for radiology students, medical students, residents and fellows.

METHODS: The sonographic model was prepared using variably sized formalin fixed fetal pigs positioned inside an appropriately sized transparent water filled freezer bag, thereby simulating an intrauterine pregnancy. The anterior abdominal wall was simulated by a sonographic gel filled freezer bag. Ultrasound was performed to assess the basic components of an obstetric examination. A new “patient” could be rapidly created by altering the size of the fetal pig, fetal position in the x, y and z-axis, by increasing the “abdominal” thickness and by changing the surrounding fluid volume.

RESULTS: The American Institute of Ultrasound in Medicine outlines the components of the standard obstetric ultrasound. Our model can be used to obtain fetal orientation; fetal and amniotic fluid biometry; visualization of fetal anatomy including orbits, lips, spine, stomach, diaphragm, kidneys, cord insertion and long bones in a realistic manner.

DISCUSSION/CONCLUSIONS: Our model is a readily adaptable, challenging and realistic resource that may enhance and accelerate sonographic skills acquisition. This model can be used as an educational adjunct to training for the standard actual anatomic survey performed on a patient.

REFERENCES (Optional):

D. McWeeney, None.

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Emerging and innovative methods and technology

Virtual transesophageal echocardiography: An online simulation of a TEE exam

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INTRODUCTION: TEE is used as a diagnostic tool by cardiologists and is also a standard imaging tool in the intensive care unit and intra-operatively in cardiac surgery, as it gives surgeons instantaneous feedback during the procedure on the nature of the cardiac defect and the success of the repair. It is performed both by cardiologists and anesthesiologists. A significant challenge in learning TEE is to obtain the 20 standard views. Few weeks of daily practice are usually required to achieve acceptable level of confidence.

METHODS: We created a web based module (fig. 1) where the user can move a TEE probe in the space and change its scanning angle to display cuts of a human heart using real TEE clips. Five fully trained echocardiographers (three anesthesiologists and two cardiologists) assessed the usability and face and content validity of this application by filling a questionnaire.

RESULTS: All of the experts agreed that it does simulate a real TEE exam, it is user friendly and accurate.

DISCUSSION/CONCLUSIONS: An online virtual TEE tool can simulate a real examination and can potentially decrease the time needed to practice on real patients to learn the basics of TEE

M. Meineri, None.

Mathematical Model for Simulation of Early Decelerations in Labor**M. B. van der Hout-van der Jagt**¹, P. H. Bovendeerd², S. G. Oei¹;¹Ma'xima Medical Center, Veldhoven, Veldhoven, NETHERLANDS, ²Eindhoven

University of

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INTRODUCTION: Medical simulation training of obstetric teams is becoming more common. Existing birthing simulators, however, do not have a model-driven system to provide the cardiotocogram (CTG) during delivery. We extended our circulation model of fetus, mother and placenta with a CTG with early decelerations.

METHODS: The mechanism of early decelerations was studied: uterine contractions reduce fetal cerebral flow, generating local hypoxia. This hypoxia results into a chemoreceptor mediated vagal response that decreases fetal heart-rate.[1,2,3] To model early decelerations, the fetal cerebral circulation is added and can be compressed by uterine contractions of 1 minute, thus reducing cerebral flow. Cerebral pO₂ is flow and consumption dependent and is input for vagal nerve response to local hypoxia. An existing model for cardiovascular control[4] was extended with an additional fire rate during vagal nerve hypoxia, leading to early decelerations. Heart rate variability was obtained from original CTG traces.

RESULTS: Cerebral flow is within the order of magnitude reported in literature, 144 ml/min.[5] Calculated cerebral steady state pO₂ is 20.5 mmHg. During early decelerations, maximum pO₂ is known to decrease with maximal 20%[6], this response was modeled for decelerations of 30 bpm. Cerebral flow reduction needed for this response was from 144 to 67 ml/min, corresponding with a vessel diameter reduction from 4.6[7] to 3.8 mm.

DISCUSSION/CONCLUSIONS: The model links head compression in labor to early decelerations in the CTG trace. The model gives an estimate of the cerebral flow reduction that occurs during early decelerations, including an estimate for vessel diameter reduction in the brain. Validation results via expert opinions will be presented at the conference.

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M.B. van der Hout-van der Jagt, None.

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Human Factors-oriented, simulation-based research

Development and Reliability of a Behavioral Scoring Tool for Simulated Pediatric Resuscitation: a Report from the EXPRESS Pediatric Research Collaborative

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INTRODUCTION: Simulation offers participants a way to acquire and apply new knowledge, perform technical skills, and demonstrate team behaviors without putting patients at risk. Crisis Resource Management (CRM) principles have been used to identify, define, teach and assess the behavioral skills required for effective team performance during medical emergencies. The ideal method for evaluating these skills during pediatric resuscitations has yet to be determined. This study describes the methods used to train raters and to test the reliability of the Behavioral Assessment Tool (BAT) for assessing behavioral performance during simulated pediatric resuscitations .

METHODS: The Behavioral Assessment Tool was developed by a team of experts familiar with Crisis Resource Management (CRM) principles. The 10 behavioural skills in the tool include: Knowledge of the Environment, Anticipation of and Planning for Potential Problems, Assumption of Leadership Role, Communication with Other Team Members, Distribution of Workload/Delegation of Responsibility, Attention Allocation, Utilization of Information, Utilization of Resources, Recognition of Limitations/ Call for Help Early Enough, Professional Behavior/Interpersonal Skills. Each behavioral skill is assigned a score of 0–4: 0 indicating novice performance and 4 indicating expert performance. Eight evaluators (six MDs, one NNP, and one RN) were trained to evaluate team leader behavioural skill performance using the BAT during a 2-hour training session in January, 2008. The training session consisted of verbal instruction and an opportunity to view 2 separate videotaped resuscitation followed by using the BAT to score performance. After the training session, the evaluators independently observed a videotaped resuscitation and used the BAT to score the performance. A second training opportunity was given one-year later. This training involved a series of sample videos delineating examples of various behaviors with a discussion on using the BAT to rate each of the behaviors. The videos were embedded in a PowerPoint presentation which further outlined the 10 items and explained their significance. The PowerPoint presentation and instructions were uploaded to a secure website. Evaluators independently reviewed the PowerPoint presentation and then scored the same video-taped demonstration viewed one year prior as well as a second video. Gold standard scores for both videos were established by the authors of the tool. Inter-rater and intra-rater reliability

was determined for individual steps by calculating percent agreement and intra-class correlation (ICC) coefficient.

RESULTS: The coefficient of reliability as measured by Cronbach's alpha was .98 for video #1 and 0.97 for video #2. Inter-rater reliability measured by Intra-class Correlation Coefficient was .98 and 0.97 respectively. When evaluator mean scores were compared to the gold standard mean scores, there was no statistical difference.

DISCUSSION/CONCLUSIONS: The BAT demonstrates excellent internal consistency and reliability when used by trained reviewers to assess behavioral performance during simulated pediatric resuscitations; reviewers are perceiving and scoring behaviors very similarly. The BAT may be useful for standardized assessment of crisis resource management skills in resuscitation training.

J.M. Anderson, None.

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Human Factors-oriented, simulation-based research

Validation of a Behavioral Scoring Tool for Simulated Pediatric Resuscitation: A Report from the EXPRESS Pediatric Research Collaborative

J. M. Anderson¹, J. LeFlore², A. Cheng³, K. B. Boyle⁴, D. T. Leonard¹, L. Corbin¹, M. Moyer⁵, K. Ventre⁶, J. Hopkins⁷, J. Duff⁸;
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INTRODUCTION: Crisis Resource Management (CRM) principles have been used to identify and assess the behavioral skills required for effective team performance during emergencies. The Behavioral Assessment Tool (BAT) has previously been used in pilot studies to measure CRM-based behavioral skills during simulated pediatric resuscitations. The objective of this investigation was to establish the internal consistency of the BAT in a large multicenter, randomized control trial.

METHODS: Behavioral performance was assessed using the BAT. Items on the BAT were developed from CRM principles. Eight evaluators were trained to evaluate team leader behavioral skill performance using the BAT; the raters demonstrated high interrater and intra-rater reliability during the training process. Each behavioral skill is assigned a score of 0-4: 0 indicating poor performance and 4 indicating excellent performance. Reliability of this tool has been previously established. For this study, the 8 trained, blinded reviewers used the BAT to score the team leader's behavioral performance in 179 simulated pediatric resuscitation videos. Half of the videos represented pre-debriefing simulations, while the other half of the videos represented post-debriefing simulations of the same study scenario. The videos were uploaded to a secure research website, and scores were submitted online.

RESULTS: Complete data was available from seven raters, 179 videos were scored. Average scores across all teams improved from PRE to POST (30.4 vs. 36.6). By repeated measures ANOVA, POST performance was significantly better than PRE ($F_{19,8}$, $p_{0.001}$). Overall interrater reliability for the total score was 0.95. The data presented are means_{SD} which ranged 0.99–1.2 (table).

DISCUSSION/CONCLUSIONS: The BAT demonstrates excellent internal consistency,

the narrow standard deviation for scores in each category reflect good interrater reliability. Trained reviewers appear to be measuring attributes of behavior in a similar manner. The BAT may be useful in standardizing assessment of the behavioral component of crisis resource management skills.

J.M. Anderson, None.

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Human Factors-oriented, simulation-based research

Simulation-Based Intervention Reduces Salivary Cortisol Levels, Stress and Burnout among Step-Down-Unit's Nurses

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INTRODUCTION: Stress levels, burnout and vital exhaustion caused by job-related stress are associated with hypothalamic-pituitary-adrenal (HPA) axis dysregulation. The aim of the present study was to evaluate the impact of simulation-based intervention as a mean to introduce better coping skills with recognized common acute stressors on salivary cortisol levels among step-down unit nurses.

METHODS: Following ethics committee approval and personal informed consent 25 nurses completed questionnaires and saliva for cortisol levels was taken at the launch of the study (t1), a week before (t2) and one month following a simulation-based intervention (t3). The intervention included one day simulation-based team and communication training in a fully equipped simulated step-down unit. Training was based on the findings of one month of structured observations looking at common stressors in the working environment performed between (t1) and (t2). The simulated environment consisted of three full-body high-tech simulators and actors (SPs) role-playing patients' family members or hospital personnel. Interpersonal and communication challenges were incorporated into clinical scenarios, followed by video assisted debriefing that focused on patient safety, mistake prevention, clinical performance, team work, and communication with patients and families.

RESULTS: Salivary cortisol decreased from 0.39_{0.17} and 0.36_{0.35} (at t1 and t2 respectively) to 0.18_{0.01} at t3. Repeated measures analysis revealed that there were significant differences in salivary cortisol levels by time ($F_{4.55}$, $p_{0.05}$), and that the significant differences were between t3 to t1 and t2. Burnout (measured on 1–7 scale) decreased from 3.2_{0.7} (t1) and 3.1_{0.8} (t2) to 2.8_{0.6} (t3) ($f_{3.42}$, $p_{0.05}$), anxiety (1–5 scale) decreased from 2_{0.7} and 2_{0.6} to 1.7_{0.4} ($f_{2.77}$, $p_{0.07}$) and subjective workload (1–5 scale) from 4.1_{0.7} to 3.7_{0.8} and 3.7_{0.8} ($f_{2.77}$, $p_{0.07}$).

Enjoyment did not change over time. Burnout correlated with anxiety ($p_{0.05}$) and work load ($p_{0.01}$), and inversely correlated with enjoyment ($p_{0.01}$). At the end of intervention and one month later participants indicated that training contributed to medical knowledge (end of training 4_{0.8} / one month 3.3₁ on 1–4 lickert scale, $p_{0.05}$), awareness to interpersonal (3.9_{0.7} / 3.8_{0.9}) and staff-patient (4_{0.9} / 3.9_{0.9}) communication aspects, ability to work as medical team members (4.1_{0.8} / 3.2_{0.9}, $p_{0.05}$) and cope with interpersonal challenges (3.9_{0.7} / 3.1_{0.9}, $p_{0.05}$). Satisfaction from training after one month but not immediate satisfaction was inversely correlated to burnout ($p_{0.05}$) but not to anxiety.

DISCUSSION/CONCLUSIONS: The study proposes that simulation-based training, targeted at well identified and relevant clinical and communication challenges, can contribute to the reduction of salivary cortisol levels, burnout and anxiety among health

professionals. Thus, hinders the vicious impact of acute job stressors on wellbeing. The findings also suggest that simulation based training can be effective both from job training and stress management perspectives.

REFERENCES (Optional):

H. Berkenstadt, None.

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Human Factors-oriented, simulation-based research

The Effect Of Visual Cues On Hand Hygiene Compliance In A Simulated Environment

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BACKGROUND: Poor hand hygiene (HH) is the single most important risk factor of healthcare-associated infection (HAI) that affects patients worldwide. This quasi-experimental controlled study assessed the efficacy of four different visual cues on hand hygiene compliance (HHC).

METHOD: 150 healthcare workers (75 physicians and 75 nurses) participated in this simulation-based study, and were randomly assigned to one of five equal-size groups (n=30): Baseline (BL) hand hygiene compliance (HHC) was assessed using an alcohol-based hand rub dispenser in its standard location in the hospital room. The four cues included: 1) dispenser enhanced with flashing lights (BLF); 2) dispenser in direct line of sight, and visible upon entry to the room (LS); 3) dispenser enhanced with flashing lights and positioned in line of sight (LSF); and 4) a sign affixed to the door warning that the room is under electronic surveillance for HHC (WS). Participants were asked to examine a standardized patient, signaling the requisite HH.

RESULTS: Overall baseline HHC was 36.7% pre-examination and 33.3% post-examination. BLF, LS, LSF, and WS cues increased the pre-examination HHC to 60%, 53.3%, 66.7%, and 93.3%, respectively. Compared to BL, LSF (p=0.022) and WS (p=0.001) produced statistically significant increased HHC before patient encounter, while only WS significantly increased post-encounter HHC (p=0.001). Comparing cues, only WS produced statistically significant increased HHC both pre-examination (p=0.001) and post-examination (p=0.001) (see table).

DISCUSSION: These data suggest that certain visual cues can improve HHC. Their differences in efficacy may relate to the explicit and implicit contents of each cue.

CONCLUSION: Our findings suggest that visual cues may improve hand hygiene compliance.

D.J. Birnbach, None.

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Human Factors-oriented, simulation-based research

Using Human Factors Methods and Patient Simulation to Determine Architectural Usability of Hospital Mock-up Rooms

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INTRODUCTION: Building a new hospital presents a rare set of opportunities to improve the quality and safety of patient care through evidence-based design. Human factors, patient simulation and usability engineering methods were used to evaluate a set of mock-up rooms built at a tertiary hospital under construction for the purposes of room design evaluation and tendering of bids. Four rooms were evaluated that will form the blueprint for about two-thirds of all patient rooms in the new hospital. The four rooms included an outpatient exam room, an emergency department exam room, an acute care unit patient room, and an intensive care unit patient room.

METHODS: Ethics certification for the study was provided by the Faculty of Medicine, Conjoint Health Research Ethics Board. Patients from the citizen advisory community and healthcare professionals (HCP), including doctors, nurses, respiratory technicians, and physiotherapists, volunteered for the evaluations. All necessary equipment was included within each of the mock-up rooms so as to nearly replicate functioning spaces. A variety of routine and exceptional procedures were developed and executed within each room to stress the integration and interaction of HCP, equipment and room design. For instance, a code blue scenario was performed using the METI ECS Stan mannequin in each room, whereas a pediatric lumbar puncture scenario was performed in the emergency exam room using baby Ryan. Additional procedure scenarios (e.g., patient admission, rehabilitation, chest tube insertion, etc.) involved citizens as standardized patients (i.e., as actors). Participant debriefings followed each scenario and involved reviewing specific interactions with each aspect of the room or equipment that affected scenario performance.

RESULTS: Digital video and audio tracks of the scenarios and extensive debriefing sessions were coded by multiple experimenters to identify specific design issues with each room. Coding categories included positive design features, access issues, collisions with objects, usability of equipment, communication issues, visibility of information, and congestion of HCPs or equipment. Scenario and debriefing codes were used to structure sets of recommendations, which were provided to the designers and discussed extensively at a number of meetings. Several hundred design recommendations were made based on objective (e.g., video and audio observations) and subjective (e.g., debriefings, usability heuristics) evidence. Common recommendation themes across rooms included: headwall re-configurations, storage size and placement, space adequacy for procedures, patient monitoring, bathroom configurations, family and patient area lighting, and technology access and use.

DISCUSSION/CONCLUSIONS: The use of simulation and standardized patient scenarios to stress the integration of equipment and HCPs in patient rooms identified potential use, access problems and threats to patient safety. Based on extensive analyses and discussions, many of the recommendations for changes to the rooms were implemented by the designers and will impact approximately 900 rooms. The human factors and patient simulation methods used to evaluate the mock-up rooms represent a new means to determine patient safety and architectural usability of hospital rooms. Strengths and weaknesses of the methodological approaches and analytic techniques used will be discussed.

J. Caird, Alberta Health Services, Consulting, Consulting Fee.

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Human Factors-oriented, simulation-based research

Does the AHA Bradycardia Algorithm Encourage Inadvertent Administration IV Bolus of Epinephrine during Treatment of Symptomatic Bradycardia?

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INTRODUCTION: The AHA Bradycardia Algorithm recommends that atropine be considered for initial treatment of sinus bradycardia and low degree blocks. If ineffective, intravenous infusion of epinephrine or dopamine is suggested while awaiting TCP.

Unfortunately, the order and bolding of Epinephrine and Dopamine may cause some confusion resulting in the administration of 1mg of epinephrine as a rapid IV bolus instead of an infusion. This study addresses the potential for administration of a rapid IV of epinephrine during treatment of symptomatic bradycardia in a high fidelity human simulator.

METHODS: Nine member teams (n=41) were presented with a sinus bradycardia scenario with poor perfusion. Team leaders proceeded with treatment as specified by the AHA Bradycardia Algorithm. Identical scenarios were presented to another group of 9 member teams (n=41). In the second group, the bolded epinephrine reference was unbolded with all other notations unchanged. During the scenario, all actions were recorded and drug interventions noted.

RESULTS: In the group using the AHA Bradycardia Algorithm Cards containing the bolded reference to epinephrine, 12.2% of the simulated bradycardic patients received an IV bolus of 1mg of epinephrine. 17.1% requested an epinephrine push which was subsequently not given. No requests for an epinephrine infusion were made. In the group using the AHA Bradycardia Algorithm Cards containing the unbolded reference to epinephrine, 2.4% of the simulated bradycardic patients received an IV bolus of 1mg of epinephrine. 2.4% requested an epinephrine push which was subsequently not given. 4.9% requested an epinephrine infusion in favor of TCP.

DISCUSSION/CONCLUSIONS: These findings suggest that the format of the AHA Bradycardia Algorithm may cause confusion so that the inadvertent administration of a rapid IV bolus of epinephrine may result during treatment of bradycardia. Simply unbolding the epinephrine reference may be all that is required to mitigate that confusion.

REFERENCES (Optional):

P. Cash, None.

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Human Factors-oriented, simulation-based research

Situation Awareness Queries as an Objective Measure of Performance in Simulated Handoff Communication

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INTRODUCTION: Research on communication in health care has focused on information delivery, but few studies have examined ways to improve understanding. For children undergoing cardiac surgery, the handoff process from the operating room to the pediatric intensive care unit (PICU) represents a high-risk period when accurate, efficient communication is vital. Our objective was to apply simulation to validate a

measure assessing provider understanding following handoff communication. We hypothesized that physicians and nurse practitioners (NP's), with their advanced medical training, would score higher than bedside nurses.

METHODS: We applied principles from the Situation Awareness Global Assessment Technique to design a 21-question multiple-choice measure to assess two domains of situation awareness: perception (simple recall of information), and comprehension/projection (the ability to use data to anticipate the patient's postoperative course). The measure was reviewed by experts in human factors, pediatric anesthesia, cardiac surgery, and critical care. PICU faculty, fellows, and staff participated in *in situ* high-fidelity simulations of standardized cardiac surgery handoffs and then completed the assessment.

RESULTS: 33 individuals participated in 2 simulations each, producing 66 assessments. Mean total score was 59.6%. Compared to nurses, physicians and NP's had higher comprehension/projection scores by 11.2% ($p_{0.04}$) and higher total scores by 8.8% ($p_{0.05}$) (Figure). Increased PICU care experience and handoff experience each correlated with higher comprehension/projection scores (Spearman's $r_s = 0.38$ and $r_s = 0.46$, respectively). Simulation experience correlated with higher perception scores ($r_s = 0.37$) and total scores ($r_s = 0.44$). 82% of participants agreed that the simulation module reflected a realistic handoff experience, and all participants agreed that the experience would improve actual patient handoffs.

DISCUSSION/CONCLUSION: High-fidelity simulation is useful for validating measures of communication. Higher scores for physicians and NP's demonstrate construct validity of the situation awareness measure in the assessment of understanding following handoff communication.

J.G. Chen, None.

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Human Factors-oriented, simulation-based research

Pediatric Surgical Team Simulation

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INTRODUCTION: Qualitative simulation provides a research framework which is built for defining collaborative relationships. This type of simulation environment is a platform to for team collaboration as a social construction, structured in communication which unfolds as an emerging social world.

METHODS: Three studies were designed using qualitative simulation from the theoretical premise of the communication theory the Coordinated Management of Meaning (CMM). The studies were completed with the Urologic, Otorhinolaryngology (ORL) and Neuro pediatric surgical specialty teams comprised of nurses, physicians and ancillary personnel in the Children's Hospital setting. The participants were brought together to move through the motions of the surgical case events. Using the real operating room environment the specialty teams are brought together to share their stories of what they deem to be effective and ineffective process and communication incorporating things they want to change. Anyone can stop the simulation at anytime to discuss change ideas and or ways in which they can be better communicators. The real operating room spaces are utilized with the help of a high fidelity mannequin; it is the environment which provides an atmosphere of recall.

RESULTS: Through the lens of qualitative simulation the studies provided a view into the teams' perspectives; the teams make changes to standardize task, process and language, the tacit activities that are usually hidden come into focus. During the process the team learns to collaborate within the conventional medical hierarchy in an unconventional

way to improve the quality of communication and ultimately patient care delivery.

DISCUSSION/CONCLUSIONS: This type of simulation provides an atmosphere for team change that normally does not transpire within the premise of acute care and operational activities. The three pediatric operating room team studies provide a rich view of the possibilities for new types of team training constructed through the team's perception of collaboration team relationships and what is then defined as their emerging social world.

REFERENCES (Optional):

L. Forsythe, Vice President of Perioperative Services, HCA Healthcare, Management Position, Salary.

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Human Factors-oriented, simulation-based research

Resuscitation Team Training using Integrated Simulator in New Emergency Department

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INTRODUCTION: Simulations have many potential applications in clinical medicine including routine basic training of individuals and teams as well as helping them to adapt to new clinical environments. Integrated simulators were used to evaluate the clinical functions of a new emergency department (ED). We evaluated how many simulations were needed to help resuscitation teams to adapt to a new ED.

METHODS: A resuscitation team including an emergency physician, emergency medicine residents and nurses, was randomly selected two days before the opening. About 40 ED staffs and hospital administrators took part in the study as observers. After orientation, the team experienced several cardiac arrest scenarios using the Laerdal ALS simulator in the present (P) ED setting and then in the new (N) ED setting. Pre- and post-simulation surveys which assessed the participant's confidence, performance ability (familiarity of the new ED) from a 10 point scale were performed. All simulations were recorded on videotapes and two emergency medicine doctors who did not participate in the simulations timed each specific resuscitation maneuvers performed by the team.

RESULTS: Before the simulations, the resuscitation team's confidence score and performance ability score were 6.50_2.16 and 5.88_2.25 out of 10, respectively. After the simulations, the scores were increased to 7.45_0.82 and 7.45_0.69, respectively. The number of integrated simulations needed for resuscitation teams to adapt to a new ED setting was 1.57_1.09. The resuscitation team's time to action, such as recognition of a cardiac arrest to the checking of the initial rhythm, insertion of the endotracheal tube and starting chest compressions was suddenly increased in the first simulations but tended to decrease as the simulations were repeated.

CONCLUSIONS: ED staffs positively rated integrated simulations as a useful team training tool in a new ED. Integrated simulations based team training may be necessary several times to enhance teamwork and patient safety.

Figure 1. Time to specific resuscitation maneuvers in each EDs(to be continued). Sec

Figure 1. Time to specific resuscitation maneuvers in each EDs(continued). Sec

J. Kim, None.

Human Factors-oriented, simulation-based research

A Novel Cognitive Aid Significantly Improves ACLS Performance in High-Fidelity Simulations of In-Hospital Cardiac Arrest

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INTRODUCTION: Adherence to Advanced Cardiac Life Support (ACLS) guidelines during cardiac arrest is associated with improved outcomes. The best educational methodology to increase ACLS adherence remains unknown. Accordingly, we performed a randomized trial to test whether a novel cognitive aid (card) improves performance during simulations of American Heart Association (AHA) MegaCodes.

METHODS: 61 anesthesia residents, interns, and medical students were randomized to MUSC (N=31) or AHA (N=30) card groups. Prior to ACLS training, each participant managed two scenarios, one using a card and one without. After pre-testing, the participants were given a standard ACLS course, as well as training on use of the AHA or MUSC card. Students then performed post-testing. The scenario stems were altered to prevent repetition bias. Each participant tested alone with a standardized 'code team.' All participants managed the same scenarios. Simulation sessions were videoed and graded according to checklists derived from the ACLS/AHA training manuals. Data was analyzed by ANOVA or t-test and presented as Mean \pm SEM.

RESULTS: There were no differences in baseline demographics, and no intragroup or intergroup differences in pre-test performance. In the AHA group, there was no intragroup difference in post-test performance between scenarios managed with card (67.7% \pm 1.9%) or without (68.4% \pm 2%). However, post-test performance in the MUSC group was significantly better with the card (75.1% \pm 1.5%) than without (70.3% \pm 1.7%), and also 7.1% \pm 2.1% better than the AHA group post-test performance with card (Figure 1).

DISCUSSION/CONCLUSIONS: The current study has two unique findings. First, we demonstrated significantly improved adherence to ACLS guidelines with the use of a novel card. Second, this improvement in performance appears to be linked directly to the actual use of the card and not only to the educational training concerning the use of the card, as there was no inter-group difference in post-testing without the card.

M.D. McEvoy, None.

Human Factors-oriented, simulation-based research

Assessing Residents' Communication Skills: Disclosure of Adverse Events

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INTRODUCTION: Recently, both the Canadian Medical Protective Association (CMPA) and the Canadian Patient Safety Institute (CPSI) have published guidelines to assist physicians in the process of disclosure of adverse events. CPSI recommends that healthcare providers receive education and training to effectively participate in a disclosure discussion, and that this training be ongoing, and be integrated into undergraduate and graduate curricula. Assessing an individual resident's ability to perform those communication skills necessary for a successful disclosure meeting during a clinical rotation is difficult. Objective Structured Clinical Examinations (OSCEs) allow an

opportunity to assess those skills. Our objective was to assess residents' communication skills required in disclosing an adverse event to a standardized patient (SP) in an OSCE venue, and to compare their performance before and after formal teaching on disclosure.

METHODS: Fourteen Obstetrics & Gynecology residents (PGY₂–5) were evaluated in a two-station OSCE. In the first station, they obtained a history and counseled an obstetrical SP, and in the second station, they met with the same SP to discuss an adverse outcome that had occurred. The residents then participated in a workshop on disclosure given by the CMPA, and were retested with very similarly paired, counseling followed by disclosure, OSCE stations. The residents' performances of the disclosure stations were evaluated using CPSI and CMPA guidelines for disclosure of adverse events.

RESULTS: The median score in the pre-workshop disclosure OSCE was 61.9% (13/21), while the median score in the post-workshop exam was 80.9% (17/21). Using the paired Wilcoxon test, the scores differed significantly with $p_{.01}$.

DISCUSSION/CONCLUSIONS: Residents' performance of a disclosure meeting following an adverse event improves with formal teaching. The OSCE is an effective technique of evaluating residents' communication skills. The CPSI and CMPA checklists may be used to assess the performance of an initial disclosure meeting.

REFERENCES (Optional):

A. Nakajima, None.

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Human Factors-oriented, simulation-based research

Impact of High Fidelity Simulation OR Team Training on Inter-Professional Students' Teamwork Attitudes

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INTRODUCTION: The safe, reliable delivery of care in the operating room (OR) requires effective inter-professional teamwork. Unfortunately, current team interaction is less than ideal. The various professions tend to maintain a "silo" mentality, fostered in part by an educational experience that rarely involves inter-professional learning experiences. We investigated the impact of conducting high fidelity simulation (HFS) inter-professional OR team training for students on their attitudes toward teambased competencies.

METHODS: During spring of 2009, 66 students participated in 10 sessions. Students were divided into teams of 6–8 participants consisting of undergraduate nurses, nurse anesthetist students, and senior medical students. Sessions involved two standardized simulated scenarios which were each followed by a focused debriefing targeting teambased competencies and emphasizing reflective practice. For each session, students completed pre- and post-training questionnaires that included a 15-item self-efficacy tool targeting teamwork competencies using a 6-point Likert-type scale. T-test with Bonferroni adjustment was used to compare calculated pre- and post-training mean item scores.

RESULTS: Matched pre- and post-training questionnaires were collected from all participants. Twenty nursing students, 20 nurse anesthetist students, and 26 medical students participated in the training. Statistically significant gains from mean pre- to post-training scores occurred on 11 out of the 15 items after the two hour session.

DISCUSSION/CONCLUSIONS: Inter-professional OR team training using HFS improves students' attitudes toward key team-based competencies. Such attitudinal change is an important first step in adopting team-based behaviors in the actual clinical

environment. It also suggests Kirkpatrick Level II effectiveness of this HFS OR team training program for inter-professional students.

J. Paige, None.

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Human Factors-oriented, simulation-based research

An Evidence-Based Approach to Rater Training and Assessment in Human Patient Simulations: Building a Quality Research Tool

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INTRODUCTION: High fidelity human patient simulation (HPS) is an increasingly popular methodology in healthcare research. While simulations provide the opportunity to create more realistic research platforms, they alone do not guarantee quality data. The quality of simulation research is highly dependent on the reliability and accuracy of raters. Research evidence details several problematic issues that may arise when using raters, including: idiosyncratic ratings, poor inter-rater reliability, rater drift, and rater errors. While these issues have been addressed in OSCE-based (Objective Structured Clinical Exam) evaluation, there are additional issues to consider in HPS based research and evaluation. The authors describe a high-level evidence-based approach to rater training that draws from simulation research extending beyond the healthcare literature. In this study, rater training principles were identified and used to design a multi-step rater training program. Training was focused on the assessment of specific healthcare team performance and team processes during patient resuscitations.

METHODS:

1. A training needs assessment was conducted. The needs assessment included identifying: (1) the knowledge and skills the rater needed to learn, (2) the specific tasks/responsibilities of the rater, (3) the person qualities important for a rater to possess, and (4) the training objectives (goals) of the rater training program.

2. Key principles from the rater training research were used to design the training program. A four-phase rater training program was developed using evidence from rater training research. The phases were: (1) *independent learning* (focused on developing relevant team process and medical knowledge), (2) *in-person training* (provided guided and independent rating practice), (3) *at home training* (allowed for additional rating practice), and (4) *quality control/assurance checks* (monitored rater reliability over time).

3. Team process and medical experts provided expert ratings for the videos used in training to provide a benchmark for rater evaluation. Experts rated and discussed the videos prior to rater training to verify the usability of the rating forms and establish expert-based norms for comparison purposes. These videos also served to establish initial rater competence and as standards used throughout the research to minimize rater drift and rater error.

4. The rater training program was piloted with two research assistants to improve and finalize the materials and training system.

RESULTS: This methodology resulted in an effective, systematically developed rater training and assessment program. Specifically, this research resulted in a four-phase rater training program based on the principles found in existing research that is practically

useful to the medical field and simulation research. The resulting training program allows for the evaluation of intra- and inter-rater reliabilities and rater drift over time.

DISCUSSION: Accurate assessment of individual and team performance is an essential requirement for quality research and high stakes assessment. This research provides a systematic series of steps to designing rater training and assessment based on evidence-based principles. Applications of this framework can help researchers develop valid measures of both individual and team processes and performance which will help ensure quality research and assessments in healthcare simulations and other domains.

T.A. Rench, None.

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Human Factors-oriented, simulation-based research

“Cannot Intubate, Cannot Ventilate” Scenario In High Fidelity

Simulation: Decision Making Process Of Staff

Anesthesiologists

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INTRODUCTION: The American Society of Anesthesiology(ASA) Guidelines for difficult airway management have been developed to help decision-making process in emergency airway situations. The objective of this study is to observe how staff anesthesiologists initially manage a difficult airway with “cannot-intubate, cannot-ventilate”(CICV) situation and determine if high-fidelity simulation has an impact on the decision-making process.

METHODS: After IRB approval and informed consent, staff anesthesiologists were called to help a resident in managing a CICV scenario. All airway adjuncts were scripted to fail and cricothyrotomy was required to reestablish oxygenation and ventilation. Following the first scenario, video-assisted debriefing focusing on non-technical skills, adherence to ASA guidelines and cricothyriodotomy skills was provided for each participant. After debriefing, participants were given the same CICV scenario without being told about the repeat. All simulation sessions were video-recorded for analysis by an expert evaluator. Outcome measures were:1)divergence from current airway guidelines; 2)time handling each airway device;3)time until the participant called for help and4)time until start of cricothyrotomy.

RESULTS: Thirty-seven staff anesthesiologists participated. There were significant variations from published guidelines. Results are shown in table1.

DISCUSSION: Deviations from ASA difficult airway guidelines were not uncommon amongst staff anesthesiologists. Some deviations, like to use of the Glidescope, may reflect new devices which may need to be incorporated into the algorithm. Unlike previous investigations, the effect of debriefing on technical skills and non-technical skills, as shown by deviations from the ASA-algorithm and ANTS respectively, was negligible. This may reflect the educational challenges in attempting to change practice habits of seasoned clinicians. The study shows that despite publication of airway guidelines, divergence exists among staff anesthesiologists. A single simulation training session may not be enough to have impact on decision making on staff anesthesiologists.

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G, Br J Anaesth 2003;(4)ASA Taskforce, Anesthesiology 2003;
N. Riem, None.

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Human Factors-oriented, simulation-based research

When is a Deceleration Perceived as a Late Deceleration?

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INTRODUCTION: Early and late decelerations (decels) on a maternal fetal heart rate (MFHR) tracing appear very similar, but have critically different implications for fetal health. Both represent a temporary decrease in the FHR. An early decel reaches its nadir coincident with the contraction peak and is considered reassuring. A late decel reaches its nadir after the contraction peak and is considered ominous. The goal of this study was to assess one's perceptual ability to distinguish between late and early decels with simulated images that enabled manipulation of specific waveform characteristics.

METHODS: Forty-one undergraduates with no prior experience reading MFHR tracings participated in an IRB approved study and viewed 40 pictures of simulated MFHR tracings, each presented on a computer screen for 3 sec. For early decels (8 images), the nadir was coincident with the contraction peak (0-sec delay). For late decels (32 images), the nadir was delayed in 4-sec increments (eight images each with 4, 8, 12, and 16-sec delays). Within each set of eight images, two depicted absent, minimal, moderate, and marked heart rate variability as defined by the NICHD in 2008. Participants indicated their responses on an answer sheet.

RESULTS: A repeated measures ANOVA of the mean proportion of late decel responses showed a significant effect for delay, $F(3.25, 129.84) = 143.948$ $p < .001$. A Sidak Bonferroni test revealed that all means differed significantly, except for the 0-sec and 4-sec delay conditions which were equivalent (see Table 1).

DISCUSSION/CONCLUSIONS: The results clearly show that individuals have difficulty perceiving late and early decels. Late decels could not be reliably distinguished from early decels unless the nadir occurred 12 or more seconds after the contraction peak. However, errors were made at *all* delay intervals. These results highlight the need for waveform pattern recognition training to improve discriminability.

REFERENCES (Optional):

M.W. Scerbo, Axiom Resource Mngt. Inc., Independent Contractor, Salary;
SimQuest LLC, Independent Contractor, Salary.

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Impact of Simulation Context and Physical Setting

The Fallacy of Perceived Loss of Workforce Time and Effort Loss While Interns Attend a 2-Week Preclinical Training Workshop

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INTRODUCTION: One of the largest perceived impediments to trainee experiential learning by departmental leaders and members is the loss of manpower in the clinical setting. Resistance to a 2-week preclinical workshop for interns met resistance during the conceptualization stage centering around the fear "what will we do without the interns for 2-weeks?" New interns are traditionally directly paired with a senior resident/fellow or attending for the first 1–3 months on service for clinical training. We hypothesized that a simulation-based procedural workshop for new intern training in

OB/Gyn procedures is of added value. We sought to evaluate the impact of a 2-week OB/Gyn and Family Medicine intern workshop on activity within these departments.

METHODS: An informal survey of several leading OB/Gyn academic institutions was undertaken to assess the method of oversight for new interns. This information was combined with change in procedural times for basic intern procedures from the first 2 workshops performed. Time and skill comparisons were made to OB/Gyn residents in the second year of training.

RESULTS: Twelve interns participated in the workshop each year, equating to 24 weeks of supervision by senior residents/fellows or staff. The intern services/call were “covered” during the 2-week period without additional residents or staff. The workshop utilized a total of 3 fellows or staff each day. Basic procedures such as circumcision and episiotomy/laceration repair typically take 30–40 minutes and 40–60 minutes respectively. At the end of the 2-week training period, the average time for interns completing the workshop was 13 minutes and 9 minutes respectively. Modeling these results suggest that on a daily basis at our institution, the efficiency gain of episiotomy care would result in 3.9–6.5 hours supervisory time and the efficiency gain for circumcision would result in 1.1–1.8 hours supervisory time.

DISCUSSION/CONCLUSIONS: A 2-week preclinical workshop provides significant benefit to the department even without the interns on the clinical services. The covering providers were not hampered by the inherent work deficiencies, inexperience or inefficiencies of working with a novice learner. Because the interns after the workshop are knowledgeable about the instruments used in procedures and have practiced using them, the net gain is increased efficiency at a rate sooner than would traditionally occur making them a useful member of the clinical team. Interns can attain a procedural skill level within a 2-week preclinical workshop comparable to or better than traditionally trained 2nd year OB/Gyn residents. This gained time could be used for additional clinical or educational activity by the supervisor each day.

REFERENCES (Optional):

B.C. Brost, None.

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Impact of Simulation Context and Physical Setting

Off-Site versus In-Situ Simulation for Pediatric Crisis

Resource Management Training: a Quantitative and Qualitative Comparison.

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BACKGROUND: Simulation is a powerful means of teaching pediatric resuscitation skills. In the past, however, its applicability has been limited by the need for centralized off-site medical simulation centers. The subsequent development of portable, highfidelity mannequins has enabled a progression toward true In-situ simulation, with programs delivered at the point of care. From June 2008 until December 2009 the University of Louisville general pediatrics crisis resource management (CRM) course was conducted using parallel off-site and in-situ sessions. The purpose of this study is to better characterize learner impressions of the off-site and in-situ environments by examining program quality improvement data.

METHODS: Pediatric residents participated in both programs. Simulation-based CRM sessions lasted one hour in both environments, and consisted of a standardized introduction to CRM and a simulated patient encounter followed by debriefing. Due to logistical constraints, nurses, pharmacists and respiratory therapists only attended the

in-situ programs. Participants were asked to rate session organization, session content, session material, mannequin, session length, session debriefing, and the use of video on a 5-point Likert scale. Participants were also asked to provide comments on programmatic strengths and areas needing improvement. Likert scale comments were compared by the Mann-Whitney U Test. Comments were analyzed using qualitative methodology. This study was exempted from review by the University of Louisville Institutional Review Board.

RESULTS: Data were collected from 28 in-situ and 12 off-site CRM sessions. On average, 3 residents and 3 nurses attended each in-situ session, with occasional respiratory therapist and pharmacist attendance. An average of 5 residents attended each off-site CRM session. No significant differences existed between the in-situ and off-site environments for any Likert scale item. Eight comment categories emerged from the qualitative analysis. These were further sorted into those that represented a standardized aspect of the program and those dealing with aspects likely to vary between the in-situ and off-site environments. Comment distributions differed significantly between environments, with positive comments chiefly occurring in standardized domains, and comments regarding needs for improvement clustering in variable domains. Variable domain comments from the in-situ environment focused on environmental fidelity and multidisciplinary team context. Variable domain comments from the offsite environment also focused on equipment issues, but included several requests for extended educational periods in which simulations could be repeated if desired in order to consolidate skills.

CONCLUSION: A group of motivated clinician teachers can successfully launch an in-situ CRM course of comparable quality to those offered at traditional off-site simulation centers. Participants viewed the off-site simulation sessions as an educational laboratory in which to acquire and consolidate skills, while the in-situ sessions were seen as opportunities to practice those skills in a realistic team context and physical environment. This suggests a natural educational progression from skills teaching at off-site centers to the implementation of those skills in the in-situ environment.

A.W. Calhoun, None.

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Impact of Simulation Context and Physical Setting

Complete Integration of a Simulation Center into Active Intensive Care Workspace: A Feasibility Study

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INTRODUCTION: Simulation is an effective means to teach the principles of crisis resource management (CRM) to pediatric providers. On-site simulation offers many advantages over the more traditional off-site approach, but many centers do not have the space to dedicate to such a program. The development of portable high-fidelity simulators has now opened the possibility of true in-situ simulation delivered at the point of care. Our objective is to report on the development, implementation, cost, and results of an in-situ simulation-based pediatric CRM program. We hypothesized that implementation of the program would increase the time spent by resident and nurse clinicians in simulation-based educational activities. We further hypothesized that the program would result in increased participant regarding the management of pediatric crises.

METHODS: This study was exempted from review by the University of Louisville Institutional Review Board. Two portable, high-fidelity pediatric simulators were purchased

and programmed with 17 pediatric crisis scenarios. Two pediatric intensive care unit bed spaces (PICU) were identified as primary “simulation nodes”, and equipped with cameras and microphones to enable video recording. A nearby family education room was similarly modified to serve as a backup node in case of high census. 6 months after program implementation, the emergency department (ED) requested that we begin CRM training exercises there, and an ED trauma bay was designated as a primary simulation node. Program faculty was drawn from a group of interested physician and nurse clinicians. Program sessions consisted of an introduction to CRM principles followed by a simulated patient encounter and a video-assisted debriefing. Sessions typically lasted 1 hour. We assessed time spent by participants in simulation-based educational activities both prior to and one year after program implementation. Participants were surveyed prior to program implementation regarding their comfort with pediatric medical crises. This was repeated one year post-implementation. Participant perceptions of the educational process were collected after each session.

RESULTS: A total of 57 sessions were offered over the course of one year with 43 (74%) occurring at a primary site and 14 (24%) at the backup site. Only 1 (1.7%) session was cancelled. Total startup costs were \$124,422, with an ongoing annual cost of \$11,695 (\$19.99 per participant encounter). Average resident participation in simulation increased from 1.7 hours/year to 3.0 hours/year. Nursing participation increased from 1.1 hours/year to 2.9 hours/year. Participant impressions of the program were positive, with an overall average score of 4.6 on a 5 point Likert scale. Small improvements were noted in comfort scores among the least experienced participants, but these did not achieve statistical significance ($P_{0.09}$ for residents, $P_{0.89}$ for nurses).

CONCLUSION: Implementation of an in-situ simulation-based CRM training course has enabled us to significantly increase the volume of simulation-based educational hours offered to our resident and nursing staff with reasonable startup costs and low ongoing yearly expenses. The course was well received by participants. Further research will be needed to determine whether the improvements noted in participant comfort with pediatric crises are truly significant, and to assess the program’s effects on objective skill measures.

A.W. Calhoun, None.

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Impact of Simulation Context and Physical Setting

Simulation in surgical education - A needs assesment

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INTRODUCTION: The use of simulation in medical education is prominent in the literature. To proceed with development and evaluation of a simulation/skills centre at the University of Alberta, Department of Surgery, an understanding of the types of simulation available and the purported benefits of these was required to maximize efforts to develop a program. The study goal was to understand the type and use of simulation and future needs within the Divisions in the Department of Surgery, thus providing direction and planning for the Department.

METHODS: Using the Kern Model of curriculum design, the needs of the Department were determined using both quantitative and qualitative methods. A valid, 22 item survey (5 point Likert Scale - Strongly Disagree[1] to Strongly Agree[5]) - was distributed to 26 key surgeons in the department. Semi-structured interviews were conducted with key informants identified through purposeful sampling. Analysis of survey results included, reliability and descriptive statistics. Interviews were analyzed for thematic

content, iteratively, with themes and sub-themes emerging from the data. Congruence of thematic analysis was validated from a second content expert.

RESULTS: Response rate _ 81%, Reliability _ 0.81

Respondents agreed that simulation activities were essential for medical students(4.14, SD 0.73), residents(4.45, SD 0.69), to practicing surgeons(3.95, SD 0.80), a good way to learn new knowledge(4.1 SD 0.62), motor skills(4.33 SD 0.86), surgical procedures(4.4, SD 0.75), improve patient safety(4.3, SD 0.64) and help people learn skills faster(4.2, SD 0.83). They also agreed that simulated activities were important for skills maintenance (3.5, SD 0.93) and team functioning(3.9, SD 0.70) and learning how an operating room functions(3.7, SD 1.0). Respondents disagreed that there was not enough time for simulation activities(1.9, SD 0.79), simulation was too expensive(2.3, SD 0.97), was not like real practice(2.8, SD 0.75), space was not available(2.4, SD 1.2) and were not a useful way to learn(1.6, SD 0.5). The majority of simulation activities occurring in the divisions were low fidelity (models to web-based). Respondents were neutral in reporting that simulation activities were unlikely to reduce operative teaching load(3.0, SD 1.0), however they agreed that trainees would be better prepared for the OR(4.1, SD 0.4). The interviews identified a number of themes regarding domains of learning, patient safety, perceived barriers.

DISCUSSION: This study identified current and future needs for development of a surgical simulation centre at the University of Alberta based on the opinions of educators and surgeons. Interview themes confirmed the identified benefits and barriers in the literature. A limitation of the study was that it did not include opinions from all learners. (i.e. medical students, residents). This information provides direction for the Department, researchers and educators in implementation of a surgical simulation centre.

M. Clark, None.

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Impact of Simulation Context and Physical Setting

Usability Simulation in the Emergency Department (U.S.E.D.)

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INTRODUCTION: The redesign of a Canadian Emergency Department (ED) offers the opportunity to improve patient care processes. Human factors engineering outlines four processes: Attention and alertness, safety-critical information, position, placement and orientation of equipment, and proximity of task, equipment and materials. Usability refers to the study of how people interact with their work environment to achieve a particular goal. Our research question asked whether simulation-based usability testing can improve the final design of an ED resuscitation room.

METHODS: Prospective, observational study. This half-day medical simulation involved an interdisciplinary team of simulation participants and observers. Instead of the individuals, the resuscitation room was our unit of analysis. Data was collected through direct observation, photography, written surveys, architectural drawings and verbal debriefings. Participants ran a series of simulated cardiac arrests in a new, fully functional, yet unopened section of the renovated ED.

RESULTS: Fifteen of 15 study participants responded. There were 4 female participants. Health care professions included RN (4), RT (1), Pharmacy (1), Biomedical engineering (1), and MD (8). Pre-simulation and post-simulation participant sketches of the layout of the resuscitation room were completed. Qualitative analysis revealed several themes including the need for standardized layouts of equipment, colour-coded

equipment carts, increased whiteboard communication, and centering the position of the patient in the room. Further, especially when wearing personal protective equipment, we recognized the need for additional communication tools.

DISCUSSION/CONCLUSIONS: This ED renovation offered a natural experiment in which to study a new, yet unopened resuscitation room. Limitations include being a single ED site with a small sample size of study participants. It might be helpful to perform usability testing at an earlier stage of the design cycle. Medical simulation offers an exciting opportunity to utilize human factors principles to improve the usability of our Emergency Departments.

C.J. Denny, None.

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Impact of Simulation Context and Physical Setting

The Unrecognized Cost of Simulation

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INTRODUCTION: Many papers have talked about the cost of simulation in education. Much of the work talks of the cost of the simulators themselves and less about the cost of the people who make the simulations happen. Today, medical educators are faced with trainees having shorter work weeks and less money being given to departments for education. Also in these fiscally fickle times physician and nurse educators are being pushed to increase clinical volume, often to the detriment of education of residents and students. Our paper looks at what may be the additional costs of simulation in one large simulation experience at our institution.

METHODS: We performed a large simulation experience for 19 new surgical interns at the University of Missouri-Columbia Russell D and Mary B Shelden Simulation Center. The simulations included three separate simulation stations: Mock Code/Team Training, Fundamentals of Laparoscopic Surgery stations and a final station using standardized patients to evaluate professionalism and history and physical taking in the clinical setting. Nineteen surgical interns participated in the experience. The four clinical simulation staff participated as well as nine surgeons, two chief residents, one physician assistant, a nurse practitioner, a nurse and 4 assistants from the department of surgery. In addition, six nurses from the hospital assisted in the simulations and postsimulation evaluations. With a few exceptions, those involved were present for 4–5 hours the day of the simulation. They helped with the simulations themselves, evaluations and debriefing after each simulation.

RESULTS: The charge to the department of surgery for this simulation was \$1000.00. This included the cost of the simulation staff, video recording time, standardized patients, room charges and set-up for four and a half hours. Calculating the missed billing opportunities for our surgeons showed a missed billing opportunity of \$16,672.63 for four hours with an average of missed revenue of \$6150.15. The surgeons together also have a calculated daily cost for that time of \$4810.83. The calculated daily cost for the assistants was about \$840.79. These costs did not take into account the cost to the hospital for lost time of the nurses who assisted in the simulation. Total cost to the department with cost of physicians and missed revenue was about \$12801.77.

DISCUSSION/CONCLUSIONS: The evaluation of cost and missed billing and revenue opportunities for the department of surgery showed this endeavor to be very expensive. The opportunity for the new interns was a priceless experience fostering confidence and learning prior to beginning a busy surgical internship. Our goal in looking at overall cost is not to discourage simulation but to encourage more funding for simulation so that there may be more involvement of physicians and nurses in the

education of medical students, nurses and residents.

REFERENCES (Optional):

N. Fearing, None.

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Impact of Simulation Context and Physical Setting

Designing the Future of Medical Education Today: Simulation Centers as Theater

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This presentation will focus on combining expertise in performing arts design and healthcare planning to create state-of-the-art educational facilities that include teaching environments where medical students master life-saving medical skills during simulated events. The television term “medical drama” and the medical term “operating theater” have new meaning when used by students and instructors at the Mayo Clinic Multidisciplinary Simulation Center. HGA Architects and Engineers combined its expertise in performing art design and healthcare planning to collaboratively design the state-of-the-art, 10,000-square-foot educational facility, which includes teaching environments where medical students training in a range of disciplines can master skills during simulated, supervised events.

Learning Environments - The simulation-based medical education Center provides accelerated learning rates by placing students in imitation patient-care settings. In these settings, students practice a curriculum of diagnostic and surgical techniques using the appropriate equipment and technology, often on life-size, physiologically responsive mannequins operated by an instructor in an adjacent control room. In addition, professional actors portray patients and family members during simulated sessions in which students practice bedside manner, crisis intervention or management, emergency-care delivery, or communication of a patient diagnosis. These situations, conducted in real-life, real-time settings, help students perfect skills without patient risk.

Meeting Medical Needs - Medical schools often have basic objectives for a simulation center that include inpatient and outpatient healthcare settings representing a spectrum of healthcare disciplines, as well as accident and crisis sites. HGA has expertise designing medical facilities and laboratories, as well as experience designing theaters and performing arts spaces. Just as in the design of actual medical facilities or theater, the design of simulation training centers requires astute planning to ensure the space is functional and equipment is accessible.

Reflecting Reality - Unlike actual medical settings, the design of the simulated environments can be suggestive, up to a point. The simulated environment doesn’t need to be an exact replica of the real thing. It only needs enough reality that students and staff can “suspend their disbelief.” Our design and technical team set out to create a situation in which people could feel like they’re really in the heat of the moment. That’s where our theater expertise came in - designing spaces that enable the simulated drama to unfold.

Kit of Parts - Simulation Centers reflect real hospital settings with key features: Lobby, Simulation Rooms, Patient Rooms, Control rooms, Observation/Debriefing Rooms and Audio-visual Technology.

H. Henderson, None.

Lean Methodology Combined with In-Situ High-Fidelity Simulation to Evaluate Pediatric Emergency Department Design

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INTRODUCTION: Lean methodology is a series of principles derived from Japanese manufacturing aimed at creating value for customers through elimination of wasteful practices. When applied to healthcare, Lean can positively impact quality, cost and productivity. Lean has been used by many healthcare organizations to improve patient flow and advance patient safety. In-situ simulation has found increasing use in the evaluation of physical settings and human factors as they apply to acute patient events. High-fidelity simulation (SIM) has also been used in the orientation of staff to new teams and clinical departments. While there is theoretical overlap between the domains of Lean and SIM, little formal work has been done to unite the respective areas. The design and renovation of a new pediatric emergency department (PED) offered an opportunity to apply both techniques. We hypothesized that Lean could be integrated with SIM to evaluate and refine the design of an acute care room for a PED.

METHODS: In-situ mock-up rooms were created from architectural blueprints. Project leads were trained in key Lean concepts including 5s/6s organization, Spaghetti Mapping and Kaizen. Two scenarios involving respiratory arrest of a child and infant were designed to mobilize maximum emergency department resources and multidisciplinary staff. Scenarios were conducted in-situ with a standardized family member and project leads at a distance to apply Lean tools, document workflow and generate field notes. Digital video recordings confirmed accuracy of spaghetti maps and captured opportunities to refine room design. Post-scenario debriefing focused on participant observations of room design and flow rather than medical management.

RESULTS: Two thirty-minute scenarios were conducted with full mapping of PED staff flow. Qualitative analysis of spaghetti maps highlighted opportunities for reducing wasted movement within the room. Chairs, carts and monitors were placed to optimize sight lines and efficient workflow. Lean analysis of the simulation resulted in multiple changes in the head-wall design. Outlets, equipment mounts and switches were sorted and grouped to match use by disciplines and positioned to improve ease of access. Results of the Lean analysis were communicated to the PED design team and incorporated in the final design of the acute treatment room. The final standardized acute room design was approved by senior hospital management.

DISCUSSION/CONCLUSIONS: 5s/6s Lean events require in-situ observations and may be applied to the design of existing or new hospital departments. When addressing the creation of a new clinical area, testing design with actual patients presents logistical and ethical problems. We successfully combined SIM with Lean methodology, allowing staff and leadership to determine whether room elements/design added value to patient care prior to actual construction of the PED. Lean also offered an innovative way to analyze and debrief simulation in-situ by focusing on non-medical aspects of the scenario. Potential future applications for Lean and simulation include refinement of existing patient care areas and analysis of existing code teams. High-fidelity simulation could also play a role in Kaizen events in acute care areas, allowing the improvement to be simulated prior to implementation with live patients.

REFERENCES (Optional):

L. Huang, None.

Quantification of Information Technology System Support for an Academic Multidisciplinary Simulation Center

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INTRODUCTION: Simulation centers with high volumes of users and/or programs can benefit significantly from information technology (IT) solutions to assist in the day-to-day operational management of the center, as well as data management for things such as participant performance reporting, usage data as well as providing data tools to support. Adequate IT solutions for the support of simulation centers can result in the reduction in the amount of administrative support needed to operate high volume centers at a high efficiency.

METHODS: We analyze the number of classes offered, participants and instructors involved in the programs conducted at an Academic Multidisciplinary Simulation Center for the 12 month period of time from July 1, 2008 to June 30, 2009 corresponding to the academic year 2008–2009. The IT solution involved in the operation of the center provides web based course content to participants as well as serving as the quiz, survey and evaluation engine for the center. The facilities management domain of the system provides scheduling and resource allocation support with an email reminder system to advise students of pending assignments and classes, instructors of pending classes, as well as notifications to support personnel who are responsible for the center operations. We quantify various aspects of the use of the IT system used to support the mission of the center.

RESULTS: There were 1,367 scheduled classes during the academic year involving 3,550 unique course participants who were involved in 10,867 scheduled educational encounters. There were 13,925 room hours utilized for the encounters. There were 32,942 user logins to the system during this period. There were 1.022 million page views to password protected sections of the simulation centers IT system which is accessed through its web site. Each of the classes had access to automated reports that could compare the results of quizzes, surveys and evaluations to all other classes in the system. The system served over 223.75 gigabytes (GBs) of content data during this time frame. The data included standard web pages, video, and Flash presentations. Total content space, including videos, is 10 GBs. The automated email reminder system sent 8,323 emails. A conservative estimate of 5 minutes of administrative time per email reminder sent would result in 700 hours of savings of administrative work for this task alone.

CONCLUSIONS: Academic based, high volume centers have extensive needs for IT solutions to assist in operational efficiency in terms of operational management, data management and course material content. High volume centers may be able to decrease the need for administrative salary support by automating aspects of operations with IT systems.

P.E. Phrampus, Chief Medical Officer, SimMedical, Management Position, Salary.

Impact of In Situ Simulated Shoulder Dystocia Drills on OB**Team Performance**

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INTRODUCTION: Shoulder dystocia (SD) is an unpredictable obstetric emergency with risks for serious injury to mother and fetus. Joint Commission suggests periodic team drills for obstetric emergencies and American College of

Obstetrics and Gynecology provides recommendations

for SD maneuvers. In response to recent patient outcomes at a large medical institution, leadership established SD-specific protocols that emphasize teamwork. Teamwork has been cited as a critical aspect of delivering quality health care (Baker, 2006), and team training has been demonstrated as the most effective way to enhance team performance (Salas, Nichols, & Driskell, 2007).

Although several successful programs have been developed and reported in the U.K. (Crofts 2006, 2007, 2008, Sorensen 2009, Maslovitz 2007) there is a dearth of peer-reviewed literature using simulation-based training (SBT) with in situ SD team drills in the U.S. The purpose of this study is to describe confidence in skills pre- and post-SBT, and skill performance after in situ simulated SD drills with immediate debriefing.

METHODS: A descriptive comparative design was used. Sixty-seven OB team members (59 nurses/5 physicians/3 PGY3s) participated in 30-minute didactic instruction supplemented with 1-hour in situ SD scenario with immediate debrief using Gaumard Noelle simulator. The SMARTER (Simulation Module for Assessment of Resident Targeted Event Responses) approach (Rosen, 2008) guided scenario and performance measure design. Clinical experts and peers rated performance on a 22-item checklist. Debrief content was guided by checklist results. Debrief verbatim notes were compiled and themes presented. A ten-question multiple choice pre/post test asked nurses to provide knowledge of clinical maneuvers, team responsibilities, legal defense components, essentials of documentation. A 5-point likert scale (very low/low/moderate/high/very high) questionnaire asked nurses to rate confidence in skills before and after SBT. Wilcoxon Sign Rank Test, ANOVA, and *t*-test ($p < .05$) results were reported.

RESULTS: Nurse confidence in all areas increased: risk factors ($Z = 5.72, p < .001$), anatomical findings ($Z = 5.453, p < .001$), recognize SD emergency ($Z = 4.578, p < .001$), anticipate medical management ($Z = 5.356, p < .001$), perform/assist in SD interventions ($Z = 5.648, p < .001$), maternal complications ($Z = 5.523, p < .001$), assess and manage complications ($Z = 5.426, p < .001$), psychosocial support ($Z = 5.152, p < .001$) and legal defense components ($Z = 6.082, p < .001$). Participants stated training would impact their work (97%) in:

1) clarity of team roles, 2) awareness of SD code alert, 3) deliberate and timely charting, 4) risk awareness, and 5) room preparation for potential emergent case. Nurses stated course objectives were met (94%) and would recommend to a colleague (95%).

Overall, there was a difference in pretest ($X = 82\%, SD = 15$) and posttest ($X = 95\%, SD = 7$) scores ($t = 7.329, p < .001$). Pretest scores were significantly lower ($F = 20.325, p < .001$) for mother-baby nurses ($X = 69\%, SD = 17, n = 15$) compared to labor and delivery nurses ($X = 86\%, SD = 12, n = 47$); however no difference was found at post-test ($F = 2.805, p = .10$), respectively ($X = 93\%, SD = 10; X = 96\%, SD = 6$).

Themes emerged from debriefing sessions: Importance of, 1) team role delineation, 2) use of code word to initiate protocol, 3) recorder to synchronize documentation for MD and RN, and 4) effective communication. Team members reported: "accurate documentation is crucial", and

“as a nurse I will feel more assertive during a SD case and feel supported by RN/MD team”.

DISCUSSION: This research describes successful integration of SBT into OB emergent care training. The session resulted in heightened awareness of SD emergencies and prompted team member engagement in SD plan of action. This initial study provides a foundation for future research to include observation and evaluation of “live” emergent event team performance and quantification of related patient outcomes.

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Impact of Simulation Context and Physical Setting

Detecting Breaches in Defensive Barriers and Creating High Reliability in Healthcare Organizations

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INTRODUCTION: Reasons’ accident model has become one of the dominant paradigms for analyzing medical errors and patient safety incidents. However there is very little empirical evidence to identify the type defensive barriers in health care settings or systematic analysis to document the nature of breaches in these barriers.

This presentation describes a study to identify the defensive barriers on inpatient units and to classify the types of active and latent breaches in these barriers. We use in situ simulation trials in hospital settings to identify the types of defensive barriers and the nature of errors that cause breaches in these defensive barriers.

METHODS: We conducted 46 trials of simulated obstetrics emergencies in two phases at six different hospitals involving 823 physicians, nurses and support staff from January 2006 to February 2008. These six hospitals included a university teaching hospital, two suburban community hospitals, and three rural hospitals. This study used an *in situ* simulation methodology to explore the nature of defensive barriers, and breaches in

those barriers. We created a high fidelity simulation by developing scenarios based on actual sentinel events. A total of three scenarios were developed based on medical record review, post-event investigation, and interviews with selected persons involved in the actual event. The scenarios are segmented into “event-sets”, a method used to stress the care delivery team in order to evoke the desired interprofessional teamwork behaviors and to interrogate the system for both active failures and latent conditions. This project was reviewed by the local Institutional Review Board.

RESULTS: We identified recurrent patterns in the occurrence of breaches with two categories: latent conditions and active failures. There were a total of 965 breaches identified by participants over 46 simulation trials, for an average of 20.8 breaches per trial. Of the 965 breaches, 461 (47.8%) were classified as latent conditions and 494 (51.2%) were classified as active failures. The average number of breaches per trial ranges from a low of 17.8 breaches to a high of 26.0 breaches. Next, we identified three specific categories of latent conditions and three categories of active breaches in the six hospitals.

DISCUSSION/CONCLUSION: This study shows a high number of breaches in defensive barriers to protect patients from injury during simulated obstetrics emergencies conducted in six separate hospitals. According to Reasons model, all sentinel events have a breached protective layer, and understanding how protective layers breakdown is the first step in safety. The idea behind defenses in depth is based on successive layers of protection, one behind the other, each guarding against the possible breakdown of the one in front. However, these models have not been empirically tested in health care. Specifically, how are barriers aligned and where are they breached? The findings from this study provide insight into understanding the nature and type of defensive barriers in inpatient settings in order to develop more rigorous safety design. A critical conclusion from these findings is that breaches in defensive barriers do not necessarily work in a progressive accident trajectory, as described by Reason.

W.J. Riley, None.

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Impact of Simulation Context and Physical Setting

The “Stop” Phrase: Standardized Patients and the Physical Exam

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OBJECTIVE: This study intended to review the use of a safety phrase (the “Stop” phrase) by standardized patients (SPs) in a nationally administered clinical skills examination.

METHODS: Being an SP is a rigorous challenge, both for mind and body. Studies have looked into the psychological rigors of SP work^{1, 2} but less is known about the physical examination stressors. The National Board of Osteopathic Medical Examiners (NBOME) Center for Clinical Skills Testing has developed a “Stop” phrase for SPs to employ when they feel discomfort during the physical exam portion on the COMLEXUSA Level 2-PE. Occasionally, the examination performed by a particular candidate can be overly vigorous and uncomfortable for the SP. However, it is important to maintain the integrity of the simulation. The “Stop” phrase gives SPs some control in these situations without compromising the flow of the encounter for the candidates. Standardized Patients are told to use the phrase, “That’s a bit rough, Doctor” if the candidate performs a physical exam maneuver or Osteopathic Manipulative Therapy in a way that is uncomfortable. Candidates are told in orientation about this phrase and not to consider these findings in their assessment of the patient. They are instructed to discontinue

or change techniques on hearing the phrase. The SP must report having used the phrase to training staff for review. Encounters are viewed by training staff to document incidence of use with respect to the area being examined, gender of both candidate and SP, and during the application of Osteopathic Manipulation.

RESULTS: In the 2007 _2008 test cycle, 3753 candidates were tested (45036 encounters). The Stop phrase was used 33 times throughout the cycle by 16 different SPs, (0.07% of encounters). The incidence of usage by individual SPs varied from not at all to 5 times (n_3). The most common use of the Stop phrase was during the abdominal exam (33.33%). Least common was use during examination of the extremities (3.03%). The Stop phrase was used more often with male candidates (n_20) versus females (n_13). The use with Osteopathic Manipulative Medicine (OMT) accounts for only 24.24%.

CONCLUSIONS: Employment of a “Stop” phrase allowed SPs to alert the candidate when they were feeling discomfort without affecting the flow of the encounter. The SPs maintained a sense of control over their bodies, and as evidenced by the usage results, the Stop phrase was not used excessively. Tracking its use will serve to document which maneuvers are repeatedly noted as painful or “a bit rough” to SPs. This can help in the casting of SPs, as well as future case development as the use of standardized patients in hybrid simulations is explored.

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2. Woodward CA, Gliva-McConvey G. The effect of simulating on standardized patients. Acad Med 1995; 70 (5):418 _20.

J.M. Sandella, None.

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Impact of Simulation Context and Physical Setting

Use of In Situ Simulations to Identify Barriers to Patient Care for Ad Hoc Multicultural and Multidisciplinary Teams in Resource-Constrained Settings

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INTRODUCTION: Key principles in crew resource management (CRM) include knowing the environment, effective communication and exercising leadership. Cultural differences and language barriers create obstacles to teamwork that can prevent effective CRM practice. This is particularly salient in ad hoc multicultural and multidisciplinary teams tasked to function in unfamiliar and resource-constrained settings in the developing world. It can be informative to study teams in situated context to identify remediable barriers to patient care and promote shared cognition amongst team members with different cultural norms and differing approaches to authority gradients and team leadership. The aims of our study were: 1) To use simulation to identify from an emic perspective team and environmental factors posing barriers to patient care within unfamiliar settings by ad hoc teams with members from different countries, practice settings and cultural backgrounds 2) To understand how in situ simulations in resource-constrained settings may impact team awareness and communication in order to improve patient care.

METHODS: A qualitative phenomenological study was conducted in 11 different countries in Africa, Asia, South America, Caribbean and Eastern Europe. In situ simulations of pediatric emergencies were conducted using low fidelity mannequins within

patient care areas including operating rooms, recovery rooms, and ward environments. Teams participating in the simulations represented surgeons, anesthesiologists, pediatricians and nurses from different countries who had come together as ad hoc teams to care for children in rural hospital settings in developing nations where access to specialty care was limited. Data from observations of 22 different simulated emergencies were coded for thematic analysis. Observations of simulations were conducted by two observers trained in simulation and debriefing techniques. Key informants representing different training backgrounds, practice settings and cultures were interviewed after participating in simulations regarding perceived benefit of the mock scenarios. Data from these semi-structured interviews was coded for thematic analysis in a manner consistent with qualitative research methodology.

RESULTS: Coding of observations and interviews yielded common themes: impact of culture on team hierarchy and willingness to challenge authority gradients, communication and language barriers impacting situational awareness, identification via simulations of equipment and logistic barriers in the environment that could impede patient care, lack of systematic emergency procedures, differences in organizational norms amongst team members, lack of clear role delineation within team construct, improvement in shared cognition through simulations, perceived educational benefit of simulations for providers less experienced in pediatrics, and improvement in resource awareness via participation in simulations.

DISCUSSION/CONCLUSIONS: Ad hoc teams in foreign environments face challenges in caring for patients safely, amongst them language and cultural barriers in addition to environmental and resource constraints that may be unrecognized. Engagement in situ of teams in simulations may promote improved communication, role delineation and identification of systems issues in the environment or setting and human factors that can be targets for remediation or advanced planning to facilitate patient safety and optimize care for patients in resource-constrained settings. Data from this qualitative study will inform the design of a simulation curriculum for multicultural teams functioning in rural settings in the developing world.

N. Shilkofski, None.

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Impact of Simulation Context and Physical Setting

The Ventriloscope - evaluating an innovative, simulationbased approach to auscultation

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INTRODUCTION: Increasing work week restrictions are decreasing residents' opportunities to diagnose and manage acutely ill patients. Simulation with mannequins offers opportunities for training within a safe environment but lacks the realism of a human encounter. Standardised Patients (SPs) offer high levels of interpersonal realism but seldom have authentic signs of illness. The Ventriloscope (VS) uses a wireless transmitter to transmit authentic heart, lung or bowel sounds to a stethoscopemounted receiver. A trained SP activates signs during the clinical examination, simulating a range of auscultatory findings within a clinical scenario. This combination of SP and technology offers a potential solution to the limitations of current simulation for the learning and assessment of core clinical skills. A recent study comparing the effectiveness of high and low fidelity simulators for recognition of heart sounds suggested an improvement in recognition of heart sounds. However, there was no significant difference in clinical skills with real patients[1]. Studies have not been undertaken either with

respiratory auscultation or with simulation devices which are used with SP. Although potential benefits of the VS have been suggested, there is no published research about its use in practice. This study explored how the VS could be used within whole patient based encounters for doctors and examined its face validity.

METHODS: Scenario development: 3 ten minute scenarios were developed; an asthmatic with a pneumothorax, a case of pneumonia and COPD and finally pulmonary oedema secondary to tachyarrhythmia. Each scenario included respiratory auscultatory signs. A Standardised Patient was trained to transmit appropriate signs (e.g. basal crepitations) to the VentriloScope, synchronising transmissions with the respiratory cycle. Data collection and analysis: observational data was supplemented by semistructured interviews using a topic guide. Interviews were transcribed, and data was analysed using standard qualitative methods. Evaluation of perceived realism was qualitative.

RESULTS: 18 volunteer physicians (6 first year doctors, 7 residents, 5 attendings) from internal and emergency medicine at St Mary's Hospital participated in all scenarios. Overall responses were positive. 17 participants (94 %) advocated that VS be used for training doctors, particularly in scenario-based teaching about the sick medical patient. Emergent themes included: quality of the pre-recorded sounds (perceived to be realistic in comparison to previous experience, although a lack of variability throughout auscultation of the chest was a concern). There was general agreement that the device added to the perceived realism of the scenarios, although the absence of other clinical features of disease (e.g. raised venous pressure) was problematic. The most junior doctors particularly valued the opportunity to experience conditions (e.g. pneumothorax) usually managed by more senior doctors. Detailed evaluation data on strengths and limitations of the technique will be presented.

DISCUSSION/CONCLUSIONS: This study establishes face validity of the ventriloScope and identifies possible uses for developing and enriching whole patient encounters. The study highlights potential value for training doctors, particularly in scenario based teaching.

REFERENCES (Optional):

1. de Giovanni, D., T. Roberts, and G. Norman, *Relative effectiveness of high- versus low-fidelity simulation in learning heart sounds*. Med Educ, 2009. **43**(7): p. 661–8.

G. Tunnicliffe, None.

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Impact of Simulation Context and Physical Setting

Identification of Medical Simulation Center Operational Characteristics at Children's Hospitals

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INTRODUCTION: Although children's hospitals are creating simulation centers at a rapid rate, it is not well documented how the operational characteristics vary between pediatric medical simulation centers. There is neither a universally accepted process for development of a pediatric medical simulation center or specific accreditation standards. There are three national non-pediatric subspecialty organizations that have developed standards and accreditation processes for medical simulation centers. A process to identify the characteristics of medical simulation centers located at children's hospitals may be used to identify operational factors and assist in the development of

accreditation standards for pediatric medical simulation centers.

METHODS: The accreditation standards from the American Society of Anesthesiologists, American College of Surgeons, and The Society for Simulation in Healthcare were reviewed. Institutional Review Board approval was completed. An internet survey was developed to identify operational characteristics of medical simulation centers located at children's hospitals. The internet survey was developed using the Survey-Monkey software system and consisted of Likert scaled and open-ended questions. The survey determined the following simulation center characteristics: primary affiliation and longevity, learner and instructor backgrounds, educational qualities, organizational and facility features, evaluation and feedback processes, and research and support staffing. Criteria for inclusion included being a freestanding children's hospital, having primary affiliation with a freestanding children's hospital, or being a children's specialty hospital within a larger adult hospital system.

RESULTS: Eighty-three children's hospitals were identified; nineteen of these hospitals had a medical simulation center. Nineteen survey invitations were sent; fifteen were returned completed. Learners and simulation instructors were from many backgrounds and disciplines ranging from general pediatrics to specialties including neonatology and pediatric cardiology. Most of the learners and simulation instructors were either physicians, physicians in-training, or registered nurses. Approximately 60% of the survey participants reported a standardized process regarding their center's organizational structure and operations. However, nearly one-third of the centers did not have a process for instructor development or have appropriate staffing. Nearly 40% of the centers do not have a regular process to evaluate instructors or provide peer feedback. Almost half of the participants did not have a plan for quality improvement or to address learner complaints. While nearly all of the centers report participating in research, most do not have dedicated Director of Research. **DISCUSSION:** This is the first known study to identify and compare the operational characteristics of medical simulation centers for freestanding and children's specialty hospitals located in the United States. Approximately 25% of freestanding and children's hospitals were identified to have a pediatric medical simulation center. Most of the identified simulation centers were operational less than five years. This implies a rapid growth of medical simulation centers among children's hospitals. In contrast, we did not identify any pediatric medical simulation center that has closed. While most of the centers have a formal process for their organizational and operations processes, a large number do not have a formal mechanism for instruction development, evaluation and feedback. Future research should focus on following changes in the requirements for simulation center accreditation.

D.A. Young, None.

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Patient related outcomes research in simulation, including patient safety

The Development of POISE (Patient Outcomes in Simulation Education) a Pediatric Simulation Research Network

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York, NY, 5Mayo Clinic Children's Hospital, Rochester, MN, 6NYU School of Medicine, New York, NY, 7Mount Sinai School of Medicine, New York, NY, 8University of Iowa Children's Hospital, Iowa, IA, 9University of South Florida College of Medicine, Tampa, FL, 10Tulane University School of Medicine, New Orleans, LA, 11Swedish Medical Center, Seattle, WA, 12NYU School of Medicine/Bellevue Hospital Center, New York, NY.

INTRODUCTION: POISE (Patient Outcomes in Simulation Education) is a collaborative research network of pediatric simulation programs that aims to measure the effectiveness of novel educational interventions through randomized trials with measurable patient-centered clinical outcomes. A proof-of-concept project that demonstrates the success of this network is described.

METHODS: The development of the POISE network began at the 2009 SSIH meeting with a group of pediatric simulation education researchers. This group has evolved into a viable network and is now enrolling interns in the first of many simulation collaborations. The network met via teleconference to develop an action plan, and review pilot projects. All sites submitted to their local Institutional Review Boards and embarked on a study in July 2009 involving 10 sites. The network collaborated in the development of data collection instruments and the study protocol in a democratic manner. Training videos were developed to "train the trainers" at each site to ensure consistency of teaching. Simulators and staffing were shared across sites as needed. An online data entry system is used to collect interns baseline data and real patient outcomes data (collected by self-reporting).

RESULTS: The network currently includes physicians from multiple subspecialties: 6 PEM, 4 NICU, 3 PICU and 2 General Pediatrics. Two educational doctorates are involved in this network. There is a spectrum of faculty experience ranging from 0–15 years with a mean of 4.6 years. Over half of participants plan to submit a project that they have developed for a network wide study. The initial study for the network involved interns from the following 10 Hospitals:

1. NYU School of Medicine/Bellevue Hospital Center
2. Weil-Cornell School of Medicine
3. Yale University School Medicine
4. Mount Sinai School of Medicine
5. Mayo Clinic Children's Hospital
6. Schneider Children's Hospital
7. Tulane University School of Medicine
8. University of Iowa Children's Hospital
9. University of South Florida College of Medicine
10. Children's Hospital of New York Presbyterian

The network developed a website, email list, and monthly teleconference to facilitate internal communication. A research assistant and data base advisory team has been developed. 210 interns have been enrolled in the first project and to date, 137 have reported on their real patient performance. The network will accept polished projects that can be evaluated in a robust manner through the large sample size afforded by network participation.

DISCUSSION/CONCLUSIONS: Miriam Webster defines POISE as "to put into readiness." Health care providers are expected to possess certain competencies after completing their training, yet it is difficult to guarantee that all trainees receive adequate

and consistent experience with clinical scenarios and procedures that occur infrequently. Innovative medical education techniques (e.g. simulation) are frequently used to fill gaps in patient care experiences. However, not much is known about whether specific methods or technologies translate into clinical efficacy. The POISE network provides an infrastructure for designing, implementing, and studying novel educational interventions across participating institutions. This network will continue to grow in size and lead to the development of simulation interventions that resulting in improved patient outcomes.

M. Auerbach, None.

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Patient related outcomes research in simulation, including patient safety

Transportable Enhanced Simulation Technologies for Pre-Implementation Limited Operations Testing in the Neonatal Intensive Care Unit (TESTPILOT–NICU)

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INTRODUCTION: Migration of a Neonatal Intensive Care Unit (NICU) to a new physical plant incurs many challenges, which are amplified by switching the culture of care to single family rooms from a bay type model. Healthcare delivery systems must be altered to maintain their efficiency and safety nets. Simulation offers a milieu to explore systems fallibility without exposing patients. Expanding upon similar endeavors in other healthcare settings, we implemented a TESTPILOT program prior moving from our existing 10,000 square foot facility to the nation's largest single family room NICU.

METHODS: This observational study was conducted in the new adjacent 50,000 square foot facility, six to nine weeks prior to moving patients, amidst the fine-tuning of facilities and communication systems. Our aims were to identify vital staff orientation material, and to assess how well existing processes would translate to the new NICU. We hypothesized that 1) participants would find the sessions fruitful, and 2) numerous process gaps would be discovered, despite meticulous planning. Scenarios developed by nursing, respiratory therapists and physicians were gauged towards common difficult situations rather than "worst case" scenarios. Content varied in each session. Each simulation session balanced typical staff demand in six concurrent vignettes, calibrated to generate two to four concurrent high acuity situations. All NICU staff was invited to participate in one of six TESTPILOT blocks, enticed only by the opportunity to explore our new NICU. They consented to an IRB-approved protocol. Participants had extensive orientation, then performed their usual duties in a 30-minute in situ simulation using low to high fidelity mannequins. After one hour of debriefing, there was a second simulation and debriefing. Facilitated debriefing was round table format with multiple scribes, directed towards discovery of specific problem areas.

RESULTS: Response to recruitment was robust; 96 participants from all specialties, with 1 to 35 years NICU experience, half of whom had never experienced simulation. Among the 85% who completed evaluations, the majority stated this experience would change their practice (Likert scale 0–5, score [SD] was 4.21 [0.73]) and would recommend simulation to their colleagues (4.84 [0.79]). The vast majority of discussion during the six debriefing sessions was constructive. Assimilating all feedback, we remodeled systems for recruiting bedside assistance and for code blue response. We recommended 35 specific changes for communication protocols, verbal and written. Workflow testing generated discrete changes on the processes for admissions (15),

running codes (7), mobilizing delivery and rapid response teams (16), family centered care (11), and radiology/laboratory (15). Fifteen safety issues were identified, as well as 38 other minor facilities and supplies issues. Areas of concern were raised for staffing (11), training (12), and the simulation itself (8).

DISCUSSION/CONCLUSIONS: Simulation is very effective for identifying process gaps prior to major institutional change. Most participants thought TESTPILOT positively affected patient care, and the ripple effect on workflow committees and staff orientation planning was remarkable. The extensive coordination required to implement such large scale simulations is well worth the benefit for systems refinement and patient safety.

J. Bender, None.

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Patient related outcomes research in simulation, including patient safety

Use Of A High Fidelity Simulation Team Training Program In Obstetric Anesthesiology To Uncover Deficiencies In Resident Competencies And Curriculum Design

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INTRODUCTION: As part of our obstetric anesthesiology resident education program, all residents at our institution participate in two separate high fidelity simulation training sessions. Residents who have previously completed two months of obstetric anesthesiology training and the introductory simulation sessions are provided with an advanced scenario consisting of the management of a high risk emergency in a parturient with a “difficult airway”. As part of the scenario, the patient is already in the operating room when the anesthesia team is called and unbeknownst to the participants, the suction has been disconnected and the laryngoscope bulb loosened. The training focuses on communication skills, teamwork, and leadership. All sessions are videotaped for facilitated debriefings. Videotape analysis revealed several unexpected performance deficits, which were readily identified by reviewers. A checklist was devised based on these behaviors, and then previously filmed sessions were reviewed and judged to quantify these deficiencies.

METHODS: Each session was comprised of 4 or 5 senior residents. Twenty four sessions were evaluated to document appropriateness of care as related to 15 specific behaviors. These included checking the laryngoscope and suction, instituting left uterine displacement, evaluating function of the IV, calling for help, communicating with the surgeon, calling for blood, preparing airway equipment, and using appropriate induction agents.

RESULTS: Three alarming findings have been identified leading to changes in our educational curriculum.

1. 20/24 groups did not identify that the patient was supine with no left uterine displacement.
2. 23/24 groups did not check either the presence of functional suction or the laryngoscope prior to induction of general anesthesia.
3. In only one of 24 groups did one resident instruct the surgeon to proceed with a cesarean when the parturient was either in near arrest or had arrested. In 50% of the groups, one member asked the surgeon to commence chest compressions

despite his/her request to proceed with a cesarean.

DISCUSSION/CONCLUSIONS: We found that simulated obstetric anesthesia training allowed us not only to teach communication and teamwork skills, but also revealed deficits in our training. Based on these findings, we have placed higher priority on the identified deficiencies in our didactic, clinical, and simulation modules.

REFERENCES (Optional):

D.J. Birnbach, None.

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Patient related outcomes research in simulation, including patient safety

Self Debriefing versus Instructor Debriefing: A Prospective Randomized Trial

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INTRODUCTION: Non-technical skills during crisis management in anesthesiology are acknowledged as important for patient safety [1]. Traditionally, when these skills are taught within a simulation curriculum, they are emphasized during a video-assisted debriefing with an instructor. Often, the rate-limiting step to a simulation curriculum is finding instructors with appropriate training and dedicated time. Formative self-assessment may address this barrier and would be more cost effective than instructor debriefing.

This study examined the effectiveness of self-debriefing compared to instructor debriefing in improving the non-technical skills of anesthesiology residents.

METHODS: After IRB approval, 50 anesthesiology residents in postgraduate years 2–5 managed a simulated crisis scenario (pre-test). Randomization was then stratified based on postgraduate year to either a self-debriefing or an instructor debriefing. In the self-debriefing group, subjects reviewed their pre-test scenario by themselves, guided by the Anaesthetists' Non-Technical Skills (ANTS) scale [2]. The instructor debriefing group reviewed their pre-test scenario guided by an expert instructor. Immediately following their respective debriefings, subjects managed a second simulated crisis scenario (post-test). Pre-tests and post-tests were evaluated by two blinded independent assessors using the ANTS scale. Data was analyzed with two-way mixed design ANOVAs.

RESULTS: Inter-rater reliability was excellent (ICC_0.80). Non-technical skills significantly improved from pre-test in all four ANTS categories (task management, team working, situation awareness, decision making; all p.19) (Figure).

DISCUSSION/CONCLUSIONS: Self-debriefing may be an effective and cost effective modality for simulation-based education that may be as efficacious as traditional instructor debriefing. These findings highlight the role of formative self-assessment during debriefing of simulation-based education and suggest that effective teaching of non-technical skills can be achieved even when instructors are not available.

REFERENCES (Optional):

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2. Br J Anaesth 2003; 90(5): 580–8.

S. Boet, This study was supported by a grant from the Network of Excellence in Simulation for Clinical Teaching & Learning, Toronto, Canada, Other Activities,

Patient related outcomes research in simulation, including patient safety

Laboratory-to-Bedside Transfer of Skills Taught in a Simulation Facility

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INTRODUCTION: Similar to "crew resource management" training in the aviation industry, Crisis Resource Management (CRM) training focuses on teaching health care workers to use behaviors associated with effective interdisciplinary team performance during high-stakes clinical events. CRM behaviors include establishing team leadership, maintaining role clarity and effective interpersonal communication, utilizing human resources and technical equipment effectively, and maintaining situation awareness. Studies suggest that these behaviors can be effectively taught in a simulated patient care setting. However, it is not known whether CRM behaviors taught in a laboratory setting transfer reliably to the clinical setting. We surveyed participants in our team training exercises to determine whether CRM behaviors taught during prior training sessions were used during actual patient care, and whether learner demographics influenced the likelihood that specific behaviors were utilized in the clinical environment.

METHODS: We surveyed health care providers in a university affiliated pediatric hospital who participated in interdisciplinary team based CRM training sessions conducted in our simulation facility between October 1, 2008 and May 15, 2009. The survey gathered data on participants' demographic information, number of previous team training sessions, and CRM behaviors used since the prior training session. Repeat trainees completed the survey once. The Intermountain Healthcare IRB approved this study.

RESULTS: 660 of 709 (93%) eligible providers completed the survey. 328 (49.7%) respondents were repeat participants in CRM training, and 270 (82%) repeat participants reported using at least one CRM behavior during actual patient care. The top three behaviors that respondents most commonly reported using during patient care were closed loop communication (46.3%), using team members' names to assign resuscitation tasks (39.0%), and using emergency equipment that the respondent first learned to use during CRM training (35.6%). Physicians were more likely than nurses to report establishing a team leader and asking for/announcing the treatment algorithm when initiating resuscitation ($p < 0.001$). Nurses from critical care areas were more likely than those from inpatient wards to report establishing a team leader, asking for/announcing the treatment algorithm, using names to assign tasks, using closed loop communication, and verifying the treatment algorithm during resuscitation ($p < 0.001$). Respondents' number of prior CRM training sessions (one vs ≥ 1) and physician specialty (general pediatrics vs critical/acute care vs surgery) did not predict the use of specific behaviors during actual patient care.

DISCUSSION/CONCLUSIONS: Most who underwent repeat CRM training in our simulation facility reported using at least one CRM behavior during actual patient care. Providers' use of specific CRM behaviors is influenced by professional affiliation and nurses' area of professional practice. While providers commonly reported utilizing CRM behaviors during patient care, fresh approaches may be needed to ensure that

specific CRM behaviors are utilized by a broader array of resuscitation team members. We unexpectedly discovered that for many clinicians, CRM training provided their first instruction in the proper use of emergency equipment. Once trained, many reported using this new knowledge at the bedside. We suggest that training programs for hospital based health care workers should emphasize the proper use of emergency equipment.

A. Brenneman, None.

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Patient related outcomes research in simulation, including patient safety

Is There a Role for Simulation in Italian Medical Schools?

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INTRODUCTION: The traditional Italian method of teaching Medicine is based on frontal lessons. Little or no time is dedicated to teach some crucial skills like cardiac defibrillation or tracheal intubation. To evaluate if a simulation center could be useful in one of the best Italian Faculty of Medicine, we performed a training needs analysis among graduating students

METHODS: An anonymous questionnaire was administered to 88 graduating students at the Vita-Salute University - San Raffaele Hospital, in Milan (Italy). The questionnaire evaluated if the students had or not the chance to practice in crucial procedures during the 6-year course. A review by the local Ethical Committee was deemed not applicable.

RESULTS: Less than 10% of the students had practiced cardiac defibrillation (Table 1). Less than 20% had performed basic or advanced airway management. More than 80% had not been trained to recognize and treat deteriorating patients. None had performed pleural or pericardial drainage or cricothyroidotomy. Only half of the students had been prepared how to give bad news to patients and relatives. Less than half had been trained on labour and delivery, and on surgical sutures. All students agreed that micro- and macro-simulations could have improved their skills significantly.

DISCUSSION AND CONCLUSIONS: The majority of the graduating students appeared inadequately trained in many procedures. Just some weeks after the questionnaire was given, the students graduated, and as doctors they were expected (and legally required) to perform safely and effectively those procedures. Even if learning crucial skills on real patients is clearly unethical, it seems still considered as “normal” or “unavoidable” by Medical Schools - but not by students, the future professors! In conclusion, training in critical procedures should be improved even in one of the best Italian Medical Schools. A center of simulation could help to fill this relevant gap.

L. Cabrini, None.

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Patient related outcomes research in simulation, including patient safety

The First Five Minutes™: Using “High-Fidelity” Simulation to Train Medical-Surgical Nurses in Completion of Key Tasks Prior to Medical Emergency Team Arrival

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The First Five Minutes™: Using “High-Fidelity” Simulation to Train Medical-Surgical Nurses in Completion of Key Tasks

Prior to Medical Emergency Team Arrival

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INTRODUCTION: Medical Emergency Teams (METs) are designed to provide critical care at the point of need outside ICUs. Unfortunately, time to effective management of critical situations by METs may be inhibited by lack of training for the first staff arriving at the scene (medical-surgical personnel). Early problem recognition, appropriate initial interventions, and rapid defibrillation for sudden cardiac arrest are skills medical-surgical personnel need to facilitate life-saving measures. The “First 5 Minutes™” was developed for non-ICU personnel to: 1) assess and improve staff completion of key resuscitative tasks before MET arrival and 2) utilize high-fidelity simulation and cardiac arrest scenarios to facilitate learning.

METHODS: Subjects were med-surg nurses consenting to participate in our study involving responses to two simulated cardiac arrest scenarios with facilitator-led debriefing sessions after each. Data were collected on: 1) pre/post surveys to assess perceptions of simulation use for learning (n_205); 2) pre/post tests to assess cognitive knowledge related to identification of crisis situations and implementation of appropriate emergency measures (n_205); and 3) small group hands-on completion of emergency tasks in the first vs. second scenario (n_238). Simulation data were electronically obtained utilizing SimMan™ and recorded into a laptop computer with SimMan™ software.

RESULTS: Positive perceptions related to simulation training all increased pre vs. post. The percent of those who “strongly agreed” they “felt comfortable managing patients before the arrival of the MET” doubled from 28% to 56%. Those strongly agreeing “the simulated experience would be realistic” increased from 44% to 64%. Correct answers to the test increased from 59% to 80% pre vs post. The correct response to “where intubation supplies were kept” increased from 34% to 64%. Prior to training, only 45% correctly answered that defibrillator pads and not ECG leads should initially be applied to the patient. This increased to 79% after the session. The majority of nurses (71%) were aware of their ability to defibrillate without physician presence prior to training. Nevertheless, this improved to 88% after training. There were improvements in the completion of all key resuscitative tasks from the first vs. second scenarios. 80.6% completion in scenario 2. Time to defibrillation, using the built-in AED feature of the monitor/defibrillator, improved by 38% in the second scenario (163 vs.101 seconds).

DISCUSSION/CONCLUSIONS: Most staff attending the training sessions “strongly agreed” with statements related to a positive experience during the simulations. Participation in the simulated cardiac arrest scenarios improved staff knowledge of information related to emergency situations and completion of key tasks. The “First 5 Minutes” is an effective means of reviewing emergency response tasks and improving standardized behaviors in clinical environments. It has been effectively conducted in a variety of settings, e.g. Radiology, Clinics, and with student nurses. Retention data as well as clinical outcomes need to follow these findings .

T.A. Dongilli, SimMedical, Consulting, Royalty.

Patient related outcomes research in simulation, including patient safety

Using Simulation for Interdisciplinary Code Blue Training: 2 Year Experience

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INTRODUCTION: Timely intervention and effective team communication are key ingredients for improved outcome from an in-hospital cardiac arrest. Health care providers are routinely required to have Advanced Cardiac Life Support (ACLS, American heart Association) certification, but their confidence and competence in managing these low frequency high stress clinical emergencies may be diluted because of duty hour restriction. Our study aimed at evaluating the confidence level of health care providers and usage of simulation for enhancing the knowledge and skills required for cardio pulmonary resuscitation.

METHODS: 178 ACLS certified health care professionals (Medicine residents 58%, Nurses 35%, Respiratory therapist RT 7%) underwent one hour faculty supervised Simulated COde Team (SCOT) training. SCOT, a true interdisciplinary team, consisted of physicians, nurses and RTs. Scenarios started with nurse performing initial assessment of critically ill patient and subsequently commencing basic life support on human patient simulator (SimMan, Laerdal Inc) while waiting for SCOT. On arrival the physicians lead the team, nurses provided CPR, gave drugs and recorded event while the RTs managed the airway. Active team communication was encouraged during training and positive critiquing was solicited during team debrief. Trainees were exposed to variety of clinical scenarios such as Stroke, myocardial Infarction, and PE leading to multiple cardiac rhythms such as Ventricular fibrillation, Ventricular Tachycardia, Asystole and heart blocks. All equipments and drugs essential for managing a code were made available. Trainees reported their pre-training level of confidence and usefulness of simulation training for key resuscitation skill using a feedback form based on 5 point Likert scale (5_ extremely confident and extremely useful, respectively).

RESULTS: Majority of trainees (76%) were “moderately confident” or “extremely confident” in performing chest compression but few had same level of confidence in their ability to “interpret rhythms” (35%), “follow ACLS Protocol”(30%), “drug selection based on rhythm”(28%) and “crowd control”(31%). The feedback was very positive and encouraging. Most trainees (85%) agreed that the simulated code training was “useful” or “extremely useful” and that they would return for more.

DISCUSSION/CONCLUSIONS: Lack of confidence for key resuscitation skills is present amongst certified ACLS providers. We introduced a simulation based interdisciplinary team training program using human patient simulator to address this concern. Simulation can be used to foster inter-disciplinary harmony and focus on common educational objectives of multiple disciplines within the health care setting, thereby reducing duplication of cost and time associated with training. Further research is imperative to identify the prevalence of this training deficit and quantify its effect on patient outcome.

REFERENCES (Optional):

M.K. Mittal, None.

Patient related outcomes research in simulation, including patient safety

Using Simulation to Orientate Operating Department Staff and Test the Safety and Usability of a New Hospital Operating Suite

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INTRODUCTION: Wellington Hospital provides tertiary services for a population of around 900,000. A new 374 bed hospital was constructed that included a surgical complex with 15 operating rooms, a day of surgery admissions area, a second stage recovery and a post anaesthetic care unit with 24 beds. When planning to move the entire surgical facility into the new facility we gave consideration to the best way to familiarise or orient our staff to the new environment. We were concerned about the management of emergency situations in the new environment. We report our experience with the use of simulation in preparing for this move.

METHODS: Staff orientation sessions occurred during the month prior to the move. The multidisciplinary teams from each operating specialty attended one four hour orientation session. These sessions included 75 minutes assigned to one or two simulations related to the surgical specialty. Each of these simulations comprised an event including anaphylaxis, local anaesthetic toxicity, massive hemorrhage, failed intubation, cardiac arrhythmias, malignant hyperthermia, cardiac arrest, umbilical cord prolapse or patient seizure. Simulations used Laerdal Resusci Anne Simulator, Crash Kelly or Megacode Kid. Monitoring was simulated using the Laerdal SimMan monitor or a biomedical ECG / pulse oximeter simulator. As this was a staff training exercise, no ethics approval was sought.

Clinically significant problems encountered were noted to be addressed prior to the move. Six months after the move staff were requested to complete a questionnaire asking whether the simulation session helped in the orientation, learning the location of emergency resources, and if had they been involved in an emergency since the move whether the simulation session helped in the management of that emergency. In addition, serious or sentinel events in the surgical complex were also monitored over this period.

RESULTS: Findings at orientation included confusion with signage and alarms, inability to detect audible and visual alarms, ice machine insufficient for malignant hyperthermia management, delay in accessing blood products, patient trolley access and lift access between delivery suite and operating rooms.

During orientation, 242 staff attended the simulation sessions and to date 87 (36%) returned a survey. Of these, 86% responded that the simulation session helped in orientation, 83% reported that it helped learn emergency equipment location, 49% reported that they had been involved in an emergency and of these staff, 65% reported that simulation session assisted in the management of that event. Comments included a suggestion to repeat simulation sessions on a regular basis.

Four serious events were reported post move. These included a respiratory event during bronchoscopy requiring anaesthetic intervention, an adult patient unable to be sedated in surgical admission due to restricted patient trolley access and, on two occasions,

significant delays reaching delivery suite from the operating rooms in response to an emergency, due to lift access problems.

DISCUSSION/CONCLUSIONS: Simulation provides a useful quality and safety methodology in the orientation of staff to a new surgical complex, indicates problems with the usability of new areas and is also predictive of the events that subsequently occur.

REFERENCES (Optional):

B. Robinson, None.

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Patient related outcomes research in simulation, including patient safety

What Factors Influence Hand Hygiene Compliance?

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UM-JMH Center for Patient Safety, Miami, FL.

INTRODUCTION: All new interns attend a patient safety course the week prior to the start of their internship at UM/Jackson Memorial Hospital. Following a three hour lecture covering the basics of Patient Safety each intern participates in three simulation sessions followed by intensive debriefings. This study assesses the interns' rates of hand hygiene compliance (HHC) during a simulated patient encounter.

METHODS: Individual participants encountered a standardized patient in a replica of one of our hospital rooms in a simulation center. Alcohol-based hand sanitizer and sink/soap were both available. Participants were asked to perform a focused cardiac exam, but they were not told that this scenario would assess HHC. If the participant approached within reach of the patient and did not practice hand hygiene, an alarm stated, "Please wash your hands." Alerts were triggered every ten seconds until either the soap or alcohol hand rub was utilized. The number of hand hygiene alerts required for each intern before HHC was recorded. In addition, post-encounter HHC was recorded. For this pilot study, there were no alerts on exiting the room.

RESULTS: Overall HHC among the 169 participants was only 37.9% pre-encounter and 3.5% post-encounter. Women's HHC was higher than men's (41.5% vs. 31.2%). International medical school graduates had significantly lower HHC compared to U.S. graduates (23.2% vs. 45.1%, $p = 0.006$) In further subgroup analysis, University of Miami Miller School of Medicine graduates had the highest rates (53%), perhaps due to an intensive course in patient safety in their second year of medical school. Of the 105 non-compliant interns, 103 complied after the alert. The majority of initially noncompliant participants performed hand hygiene after only one alert (92 of 105). Two residents (1.9%) never complied despite having the alert repeatedly activated.

DISCUSSION/CONCLUSIONS: This study utilized video surveillance as well as an audible alarm to assess HHC without informing the participants, thus minimizing the Hawthorne effect. The rate of HHC without the intervention was 37.9%, comparable with the rate of HHC reported in other studies. We also observed marked variation in HHC comparing international to US graduates. This is not surprising since local culture has been shown to markedly influence the rate of HHC. but suggests that programs with international graduates should consider explicit instruction in hand hygiene. Utilizing an approach with direct video surveillance and auditory alarms, we achieved 98.1% compliance of hand hygiene prior to patient examination. This level of hand hygiene compliance has not been previously possible using conventional methods There was, however no HHC carryover on exiting the patient room. The gender difference

we observed is consistent with previous studies. A multi-faceted approach is needed to integrate HHC as an automatic behavior both before and after patient contact. One strategy is to provide improved patient safety instruction, specifically on hand hygiene, in the medical school curriculum. Using a simulated scenario followed by focused debriefing, as performed in this pilot study, may also improve long term HHC. Ultimately alarms such as the one utilized here may be necessary.

REFERENCES (Optional):

J.S. Sanko, None.

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Patient related outcomes research in simulation, including patient safety

Central Venous Catheter Dress Rehearsal: Every Line Counts

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INTRODUCTION: Central line-associated blood stream infections (CLABSI) are a key patient safety issue. Observations and focus groups at this children's hospital suggest inconsistency in knowledge and implementation of central venous catheter (CVC) dressing change policy. A novel CVC Dress Rehearsal program was developed using simulation allowing nurses to practice CVC dressing changes prior to providing direct care for patients with a CVC. The purpose of this study is to determine if "just in time" and "just in place" simulation based training will improve staff nurses' confidence and competence in knowledge and psychomotor skills during CVC dressing change practice.

METHODS: Pediatric staff nurses were randomly selected from inpatient care units, the post anesthesia care unit, OR, radiology/sedation unit, and outpatient oncology clinic for participation. Using a novel bedside CVC Dress Rehearsal program (a mobile cart with a simulated patient chest/arm), participant compliance with CVC dressing change policy, including both cognitive and psychomotor skills, was assessed. Individualized, immediate feedback was provided at the bedside to improve compliance. Post instruction, an identical skills assessment was completed. During the course of this study, a "train to excellence" strategy was implemented (subjects informed that training would continue until perfect compliance with no corrective prompts was achieved). Pre and post training evaluations included: self evaluation, written knowledge test and psychomotor skills evaluation by two expert facilitators using a standardized checklist; and facilitator observations of actual CVC dressing changes. Analysis by descriptive statistics (mean_ SD), paired t-test and chi-square test.

RESULTS: Over 9 months, 375 staff nurses participated in the CVC Dress Rehearsal program. 100% (375/375) of the nurses reported self confidence improvement in knowledge and skills for CVC dressing change (Knowledge: Pre: 4.1_0.8, Post 4.5_0.6, $p_{0.0001}$; Skills: Pre: 4.1_0.9, Post 4.5_0.6, $p_{0.0001}$). The "train to excellence" strategy improved nursing dressing change compliance: 165/375 (44%) vs. 99/284 (35%) during the initial dressing change ($p_{0.018}$). Nurses who participated in the Dress Rehearsals were more apt to correctly perform a dressing change on a patient although this did not reach statistical significance (132/173, 76% with Dress Rehearsal vs. 151/209, 72% without Dress Rehearsal, $p_{0.26}$). CLABSI rates decreased from 4.9/1,000 to 3.2/1,000 over the 9 months post implementation of the CVC Dress Rehearsal program ($p_{0.001}$) without additional changes to the CLABSI implementation program at this hospital.

DISCUSSION/CONCLUSIONS: A novel simulation based bedside CVC "Dress Rehearsal" program can improve self confidence and competence in cognitive and

psychomotor skills for CVC dressing change. This demonstrates that a simulationbased, one-on-one “just-in-time” and “just in place” educational program can hold nurses accountable for their practice and provides a supportive learning environment in which to expect success and to practice communication and feedback skills. This innovative method of education helps to eliminate variations from the current policy thus promoting a culture of safety and excellence in nursing. This research study is supported by an award from The Center for Pediatric Nursing Research and Evidenced Based Practice at The Children’s Hospital of Philadelphia

A. Scholtz, None.

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Patient related outcomes research in simulation, including patient safety

Severe Contrast Reaction Emergencies: High-Fidelity Simulation Training for Radiology Residents and Technologists

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INTRODUCTION: Severe reactions to radiology contrast medications can be lifethreatening, and although rare, effective recognition and management are essential at improving outcomes. Many radiologists prepare for these emergencies by completing an Advanced Cardiac Life Support or Pediatric Advanced Life Support course. The majority of the curriculum of these courses addresses a different set of patient problems that rarely apply to a radiologist. In addition, studies have demonstrated a rapid decline of skills following these courses. Because of these concerns, we designed a high-fidelity radiology simulation course focusing on severe contrast reactions and immediate treatments. Our hypothesis is that knowledge gained from simulation training about recognition and treatment of anaphylaxis due to contrast reactions would improve with this educational intervention.

METHODS: We utilized a prospective pre and post test study design to evaluate the effectiveness of a simulation course designed to enhance the knowledge of radiology residents and radiology technologists to recognize and care for severe life threatening contrast reaction emergencies. A one hour course using high-fidelity simulators (Sim-Man, Laerdal and METI EPS child) included an introduction and two simulated contrast material reaction scenarios each followed by a debriefing session. Residents and technologists worked in teams of 3–5. Our learning objects for each case focused on demonstrating when and how to use an EpiPen® and showing when and how to perform proper basic life support skills. Each resident and technologist was administered a pre test prior to the start of the case scenarios and a post test following the debriefing session. This study was institutional review board approved. Scores from the pre and post test for the residents and technologists and at both time points were compared utilizing a paired samples t-test.

RESULTS: Nineteen radiology residents (four from post-graduate year three level and five each from post-graduate years two, four, and five) and thirty one radiology technologists participated. The average test scores were higher and improved significantly following the simulation lab for both the radiology residents (57% vs. 82%, p_0.001) and technologists (47% vs. 72%, p_0.006). Anonymous evaluations demonstrated that the experience was well received by residents and technologists with 98% (49/50) of

learners rating the experience as extremely or very helpful. Important learning themes included the knowledge of the use of EpiPen® and basic life support skills.

CONCLUSIONS: High-fidelity simulation for radiology residents and technologists can significantly improve recognition and knowledge in treating severe contrast reactions. Supplemental simulation training that focuses on EpiPen® use and basic life support skills during the first five minutes of a severe contrast reaction may be an important adjuvant to radiology resident and technologist education.

N.M. Tofil, None.

Appendix 9: Sample (8 of 166) Works-in-Progress Submissions (Non Peer- Reviewed)

001 WORK IN PROGRESS

Orientation of First Year Anesthesia Residents: Comparison of Highfidelity Simulation & Supervised Clinical Instruction in the OR

J. Adams, A. Duhachek-Stapleman, B. Hurlbert, J. Sullivan, A. Agrawala, C. Dennis; University of Nebraska Medical Center, Omaha, NE.

Orientation of First Year Anesthesia Residents: Comparison of High-fidelity Simulation & Supervised Clinical Instruction in the OR Background: Orientation of residents to clinical duties and decision making is often done in conjunction to patient care. This “on the job” training may create anxiety and poor data retention. Anesthesiology requires new residents to respond with diagnosis and appropriate management quickly. The aim of this study was to compare clinical instruction in the operating room (OR) and high-fidelity simulation as methods of instruction for beginning anesthesia residents and their effect on resident comfort level, knowledge and attitude during the beginning weeks of residency.

METHODS: Beginning anesthesia residents (N = 13) were randomly assigned to two groups. The first group underwent one day orientation using high-fidelity simulation. The second group participated in clinical orientation in the OR. Prior to orientation all residents completed a brief survey to assess their comfort level in providing anesthesia on the first day of residency. Assessment was based on a 1 to 5 scale, 5 being the most comfortable and 1 being not at all comfortable. Curriculum to be covered was standardized for both groups and instructors for both groups were given the same topics to be covered during the initial orientation day. The initial survey was then repeated again at the conclusion of the initial orientation day. Residents from both groups then continued clinical training in the ORs. After two weeks from the initial survey implementation, the residents then completed the survey a final time. Faculty were also asked to evaluate each resident using standard evaluation based on ACGME core competencies. Faculty were blinded to resident group assignment. Residents were evaluated on a scale of 1 to 3, 1 indicating resident does not meet expectations for his/her training level and 3 indicating the resident exceeds expectations.

RESULTS: The initial survey was completed by 13 CA-1 residents. The OR Group (Group 1) consisted of 7 residents; the Simulation Group (Group 2) consisted of 6. The combined mean response for all participants was 1.99. At the end of day 1, responses from the OR group produced a mean of 3.02 which correlated to a 52% increase from the initial mean. Responses from the Simulation group generated a mean of 3.25 which correlated to a 63% increase from the baseline mean. The same survey repeated after 2 weeks of clinical training showed a mean response of 4.0 (101% increase) for the OR Group and 4.22 (112% increase) for the Simulation group. Faculty perception assessments were completed by UMNC anesthesiologists for 7 residents from Group 1 and 6 residents from Group 2. The mean for residents in Group 1 was 2.26, while the mean for residents in Group 2 was 2.05. Conclusion: In the earliest stages of Anesthesia residency, clinical instruction using simulation has a positive effect on resident comfort level in the entering the operating

room and can provide residents a base of knowledge more easily retained without compromise to patient care.

J. Adams, None; A. Duhachek-Stapleman, None; B. Hurlbert, None; J. Sullivan, None; A. Agrawala, None; C. Dennis, None.

002

Group Work With Clinical Maps: A New Training Method For Constructing A Medical Knowledge Structure Of Stroke In ER

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INTRODUCTION: We produced a group work training of an initial management of stroke based on ER clinical maps for doctors and nurses.

METHODS: An ER clinical map of stroke containing a structure like a clinical path shows a process of treatment according to an algorism of the initial stroke management in emergency room. In training, participants were divided several small groups. Each small group was given same tasks to complete empty clinical maps according to information concerning to stroke patients from their facilitators. All member of each group accessed the imaginary patients with discussion and gave some treatments and managements step by step according to the algorism.

RESULTS: Each group completed their empty maps and reached structures modified from standard ones. Discussion: the results obtained in this study suggested that the participants could understand initial managements of patients with different type of stroke through recognizing the total process of the examinations and treatments in ER and that adequate information and effective support given by facilitators led this training to success.

CONCLUSIONS: ER clinical maps and group work trainings with them might help participants to understand the total structures of medical knowledge and skills of initial stroke management in ER.

Y. Ajimi, None; T. Sakamoto, None; T. Nakamura, None; T. Sagawa, None; N. Morimura, None; H. Ikeda, None; T. Fujita, None; H. Hamada, None; M. Nishida, None; H. Okudera, None.

003

Evaluating the Effectiveness of a Formal Educational Program and Simulated Training Model for Evaluation of Resident Competency in Neonatal Circumcision

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INTRODUCTION: Neonatal male circumcision is a common procedure performed by different medical specialties in the United States, including obstetrics, family medicine, urology, and pediatrics. The American College of Obstetricians and Gynecologists (ACOG) states existing evidence is insufficient to recommend routine neonatal circumcision, that the exact incidence of complications after circumcision is not known, but data indicates the most common complications are local infection and bleeding. The American Academy of Pediatrics (AAP) states it is essential

to provide pain relief for infants undergoing circumcision, and emphasizes that physicians who perform circumcisions should be sufficiently skilled at the technical aspects of the procedures to minimize complications. The Society of Teachers of Family Medicine (STFM) Group on Hospital and Procedural Training proposed a list of required core procedures within the scope of family medicine that all family medicine residents should be able to perform by graduation, which includes newborn circumcision. Each organization suggests standardized training procedures and tools for assessing resident competency in performing specific procedures such as circumcision be developed. Clinical faculty from the Simulation/Robotics department, Obstetrics, and Family Medicine collaborated on a formal educational program for procedural skill training in neonatal circumcision. We focused on two techniques - the Mogan's clamp and the Gomco clamp, and developed competency checklists for each. There are no commercial anatomically correct models currently available to train residents on neonatal circumcision. We developed a low-fidelity anatomical simulation model adapted from the Brill and Wallace[i] cocktail wiener model and attached it to a high-fidelity newborn simulator model to provide a realistic human simulation model capable of crying if not properly assessed and treated for pain before or during the procedure.

METHODS: Learners are sent study materials prior to the workshop. A pretest is given and immediately graded and returned so incorrect responses can be reviewed. A brief didactic presentation is then followed by hands-on practice using the low fidelity models. Each learner must do at least 2 Gomco and 2 Mogan procedures and are evaluated using the competency checklists. For the final check-off, the learner uses the method of their choice on our combined low/high fidelity simulation model. Learners complete a post workshop evaluation and a post test. After completing their first actual human patient circumcision, the learner completes a survey comparing how realistic the simulated experience was to the actual experience.

RESULTS: IRB approval was received in September 2009 and active research investigation will begin in October 2009. Preliminary results are expected by early 2010.

DISCUSSION/CONCLUSIONS: The purpose of this research study is to evaluate the effectiveness of an already established simulation/educational program for competency in neonatal circumcision. There are two key research objectives: 1.) to compare the realistic adequacy of the simulated learning environment to the actual clinical experience and 2.) to compare the use of a neonatal circumcision procedural competency checklist tool with measurable outcomes in a simulated learning environment and actual clinical practice. REFERENCES (Optional): [i] Brill JR, Wallace B. Neonatal circumcision model and competency evaluation for family medicine residents. Fam Med. 2007 Apr;39(4):241-3
C. Alvarado, None.

Improving Outcomes Using Videotaped Role-modeling During Crisis Resource Management (CRM) Training

M. Anderson, J. LeFlore; The University of Texas at Arlington School of Nursing, Arlington, TX.

INTRODUCTION: The purpose of this study was to improve outcomes among children by improving team effectiveness. One approach that has yielded positive outcomes is to 'show' learners how teams should work together.¹

METHODS: Nurse Practitioner students enrolled in a pediatric management course participated in this quasi-experimental repeated measure design with immediate and delayed (12 weeks) posttest study. All received reading assignments on respiratory emergencies. Each completed a knowledge pretest, a self-efficacy pretest, and a demographic data-sheet. In teams of 4 students, all participated in a simulated respiratory emergency scenario in an office setting followed by a lecture on Crisis Resource Management (CRM) concepts. Half of the teams (Group B) then watched a videotape of a simulated respiratory emergency in an office setting showing experts modeling CRM concepts. To evaluate learning, each team completed a second respiratory emergency scenario in an office setting, and each student completed a knowledge posttest 1, self-efficacy (posttest 1), and satisfaction survey (survey 1). Twelve weeks later, each team completed a respiratory office emergency scenario in an office setting and each student completed the knowledge posttest 2, self-efficacy 2, and satisfaction survey 2. Each of the teams was videotaped in each scenario. Two blinded reviewers scored these videotapes to assess each team's behavioral skills at the 3 time periods. Technical skills were scored by a different expert at the same 3 time periods. Statistics included a student's t-test (interval data), chi square, and MANCOVA with a within group design to assess the main effects and to control for the interaction effect between the outcome measures. Bonferroni corrections were used.

RESULTS: Sixteen students participated (8 per group). There were no differences between the groups on demographic variables. There were no significant differences in knowledge between the groups when comparisons were made between the pretest and posttest 1, posttest 1 and posttest 2, and pretest and posttest 2. There were no differences in knowledge within the group as a whole when comparisons were made between the pretest and posttest 1, posttest 1 and posttest 2, and pretest and posttest 2. On self efficacy, there were no differences between the groups at the 3 time periods. There was a significant difference in self-efficacy within the group as a whole when comparisons were made between the pretest and posttest 1 ($p=.002$), pretest and posttest 2 ($p<.01$), and posttest 1 and posttest 2 ($p=.03$). On the second demographics, there were no differences between the groups on the number of pediatric clinical hours/clinical experiences. There were no differences between the groups on satisfaction. There was a significant difference between the groups between the pretest and posttest 1 ($p=.02$) and between posttest 1 and posttest 2 ($p=.001$) on the Behavioral Assessment Tool (BAT). There was no difference between the groups on technical skills in the 3 time periods.

DISCUSSION/CONCLUSIONS: It appears that in this small pilot

study, videotaped role-modeling may not be as effective as in-person expert role-modeling. Repetition with larger numbers is suggested. REFERENCES (Optional):

M. Anderson, Laerdal Foundation for Acute Care Medicine- grant money for this research, Other Activities, Other Financial Benefit; The Smart Hospital™ is a Laerdal Center of Educational Excellence in Simulation, a Hill-Rom National Demonstration Showcase and the CareFusion Nursing Discovery Center., Other Activities, Other Financial Benefit; J. LeFlore, Laerdal Foundation for Acute Care Medicine- grant money for this research, Other Activities, Other Financial Benefit; The Smart Hospital™ is a Laerdal Center of Educational Excellence in Simulation, a Hill-Rom National Demonstration Showcase and the CareFusion Nursing Discovery Center., Other Activities, Other Financial Benefit.

005

Teaching Lumbar Puncture Using Simulation

M. Anderson, S. Dooley-Hash, S. Hamstra, R. Jones; University of Michigan, Ann Arbor, MI.

INTRODUCTION: Lumbar puncture is a commonly performed Emergency Department procedure which is rarely formally taught to medical students or interns. This results in an uncomfortable and potentially unsafe experience for both the student and the patient the first time the procedure is performed by a student. It would be preferable to have formal, supervised instruction in this procedure prior to attempting it on a patient. The traditional apprenticeship model is difficult in the current medical teaching environment given the constraints of duty hour regulations, availability of faculty supervisor/teachers, and patients needing the procedure. Potential solutions to this problem include utilizing a mannequin simulator or an instructional video as teaching adjuncts to reading in order to improve student familiarity with the procedure. The objective of this study is to assess student performance of lumbar puncture following reading alone compared with reading in addition to either viewing a step by step video or hands-on experience on a mannequin with real-time feedback from an expert (senior emergency medicine resident or faculty).

METHODS: This study is currently being conducted during the 2009-2010 academic year. More than 170 medical students will rotate through the Emergency Department during this time. Medical students starting their one month rotation are recruited as subjects. All students receive a pre-intervention questionnaire regarding their previous lumbar puncture experiences, teaching of the procedure, and confidence with the procedure. All students are then provided reading materials describing indications, contraindications, risks, benefits, detailed equipment needs, and step-by-step procedure information. A brief power point presentation covering the same information is shown to all students. After this, students are randomly assigned to three groups: control, video, simulation. The control group reviews the reading material. The video group is shown a step-by step instructional video (from NEJM, used with permission). The simulation group practices on a mannequin lumbar puncture simulator with an expert providing feedback and direction. Finally, all students are assessed by an expert on the simulation mannequin using a modified global rating scale which assigns a number score (1-5) to

the performance of key steps in the procedure. The students also fill out a post-intervention questionnaire about their comfort with the procedure and perceived effectiveness of their teaching arm. The outcomes measured will be the global rating score and difference between pre- and post-intervention self assessments with any differences between the control, video, and simulation groups being of particular interest.

RESULTS: Data has been collected for five of eleven groups of students that will rotate through the Emergency Department this year. Analysis is pending completion of data collection in April, 2010.

DISCUSSION/CONCLUSIONS: Pending completion of data collection and analysis.

REFERENCES (Optional): Videos in clinical medicine. Lumbar puncture. - Ellenby MS - N Engl J Med - 28-SEP-2006; 355(13)
M. Anderson, None; S. Dooley-Hash, None; S. Hamstra, None; R. Jones, None.

006

Low-tech Camera Navigation Models for Laparoscopic Surgery

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INTRODUCTION: One of the most important laparoscopic skills for surgeons is the ability to efficiently and accurately navigate within the surgical field. This requires a well-developed ability to translate two-dimensional monitor representations to three-dimensional movement in space, as well as mastery of rotational and fulcrum effects associated with positioning and instrument design. High-tech simulators provide the opportunity for training, but are expensive for many programs.

METHODS: The project's purpose was to design a low-cost option for training laparoscopic camera navigation and to design a training methodology to implement the models for in surgical training. Iterative design and development methods included: selecting the trainer platform, sketching potential models, selecting materials, and building/testing models for effectiveness. Camera navigation task analysis informed the design of the instructional methods.

RESULTS: Models were designed for a standard box-trainer platform and configured in form to represent an insufflated abdomen. Models were created using materials that are readily available from craft supply stores; foam, netting, fasteners, thread, etc. Eight models were developed with increasingly complex configuration. Instructional methods make use of audio narration that provides the learner with directions on how to proceed through the activity using the model (e.g. move lateral to anterior space behind the obstruction and locate #3) that are captured on video. Time and accuracy are measured by comparing performance to a master standard. Models cost between \$2-4 each. Audio narration is per ipod shuffle (\$59 each).

DISCUSSION/CONCLUSIONS: The low-tech model provides a viable platform for developing laparoscopic camera driving skills at an affordable cost. The use of the model as a platform for determining best practices for verbal instructions between surgeon and assistant (camera driver) during surgery is being assessed. Development of assessment metrics to evaluate the model's potential for discriminating between learner levels is in process.

REFERENCES (Optional):

P.B. Andreatta, None; M. DeMerle, None; R.S. Richter, None; K. Reynolds, None.

007

How a New, Small, Underfunded Simulation Center Engaged a Community of Practice to Design and Implement a Model that Assesses Student Learning Objectives

P. L. Arciaga, L. Richlin, S. Merino; Charles Drew University of Medicine & Science, Los Angeles, CA.

INTRODUCTION: How does a new, small, underfunded simulation center demonstrate to faculty the benefits of utilizing simulation technology in their courses? The Using Simulation Technology to Enhance Learning Faculty & Professional Learning Community (Sim FPLC) constructed a process that moves from clear, observable, and measurable student learning objectives through conduct of simulation events to assessment of outcomes for learning objectives.

METHODS: Faculty & Professional Learning Communities (FPLCs) are a ‘community of practice’ among a discrete group of scholars engaged on a specific topic. In Fall 2008, nine applicants were accepted into the Sim FPLC, based on their interest in using simulation in a course and in developing a university-wide protocol for the simulation center. After reading the text, *Using Simulations to Promote Learning in Higher Education* (Hertel & Millis, 2002), they designed a “Simulation Blueprint” for implementing a simulation event. The development cycle begins with institutional goals and instructional objectives, moves through preparation and production of simulation events, to assessment of 1) the event, 2) student and faculty satisfaction, and 3) achievement of student learning objectives. Three pilot simulation events were conducted with medical and physician assistant students, and participant feedback informed elaboration of cycle specifications.

RESULTS: The Model (attached) describes the cycle from student learning objectives, simulation center preparation, and faculty training, through event simulation to student learning assessment. This poster includes forms for each step in the cycle.

DISCUSSION/CONCLUSIONS: The FPLC strategy was a successful, feasible methodology to encourage use of simulation technology for a new, small, underfunded center. Simulation centers in similar situations could benefit from the same approach.

REFERENCES (Optional): Hertel, J.P., and Mills, B. J. (2002). *Using simulations to promote learning in higher education*. Sterling, VA: Stylus. P.L. Arciaga, None; L. Richlin, None; S. Merino, None.

How a New, Small, Underfunded Simulation Center Engaged a Community of Practice to Design and Implement a Model that Assesses Student Learning Objectives

P. L. Arciaga¹, L. Richlin², S. Merino²; ¹Charles Drew University of Medicine and Science, Los Angeles, CA, ²Charles Drew University of Medicine & Science, Los Angeles, CA.

INTRODUCTION: How does a new, small, underfunded simulation center demonstrate to faculty the benefits of utilizing simulation technology in their courses? The Using Simulation Technology to Enhance Learning Faculty & Professional Learning Community (Sim FPLC) constructed a process that moves from clear, observable, and measurable student learning objectives through conduct of simulation events to assessment of outcomes for learning objectives.

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RESULTS: The Model (attached) describes the cycle from student learning objectives, simulation center preparation, and faculty training, through event simulation to student learning assessment. This poster includes forms for each step in the cycle.

DISCUSSION/CONCLUSIONS: The FPLC strategy was a successful, feasible methodology to encourage use of simulation technology for a new, small, underfunded center. Simulation centers in similar situations could benefit from the same approach. REFERENCES (Optional): Hertel, J.P., and Mills, B. J. (2002). *Using simulations to promote learning in higher education*. Sterling, VA: Stylus.

P.L. Arciaga , None; L. Richlin , None; S. Merino , None.

Appendix 10: President's Message

Dear Attendees,

Welcome to the 10th annual International Meeting for Simulation in Healthcare (IMSH). Our 10th anniversary is an important milestone for us and we have marked the event with our 2010 IMSH conference illustration, created by Stephen Francis of the Skills Development Centre in Brisbane, Australia and chosen by you from a field of many submissions. The theme of this year's meeting highlights that we are **"At the Threshold of a New Frontier"**. We have been gathering simulation enthusiasts together to network and share knowledge for 10 years. It is a time to celebrate and a time to reflect on where we have been and where we want to go as a society. The IMSH meeting started as an adjunct to a meeting for the Society for Technology in Anesthesiology. That group's leadership, support, and nurturing are directly responsible for our launch as a society and the growth of our meeting. SSH includes many disciplines, but we recognize the importance and the need for us to become more global in our outlook. The diversity of our membership provides an amazing opportunity to learn from one another. The educational programs are wonderful, and the opportunity to renew old friendships and make new ones is an important part of the meeting. Our leadership and leaders from other organizations with an interest in simulation have worked diligently to promote an atmosphere of sharing and cooperation. In addition to our established affiliates, SESAM, ASSH, and ASPE, we welcome our new affiliates, International Nursing Association for Clinical Simulation and Learning (INACSL), the Dutch Society for Simulation in Healthcare, and the Brazilian Society for Simulation in Healthcare. We would like to thank them for their willingness to allow us to work with them to improve healthcare education and safety. Our conference will have both organizational and educational events. There are a number of "SIGs", special interest groups, which bring together people with specific shared interests. With the proposed changes in our bylaws, SIGs will now be able to move on to the next stage - becoming full fledged sections of the SSH. This will foster the ability of the SSH to promote the development of simulation in these special areas. We are also happy to announce the addition of an immersive track to our meeting. This track was added at the request of numerous attendees and will allow participants to engage in simulation education directly. We hope to see you at our annual membership meeting Monday morning at 7:30 just prior to our first plenary session. The meeting allows members to vote on suggested bylaw changes, meet new officers and Board members, and honor those individuals that have provided special service to the Society. We encourage you to participate in our democratic process and honor those who provide special service to our organization. We would also like to thank our exhibitors and our sponsoring partners. Without them the meeting would look quite different and indeed the field would be different. Your dialogue with our partners helps them to improve their products and develop new products to bring to the next conference. The growth of technology in this field is astounding and is a direct result of their efforts and yours. Since its initial meeting in 2001, IMSH has grown from dozens of participants to thousands. We thank all of you for trusting us to create an environment that will promote the field, and to allow the IMSH meeting to be a great opportunity for those who want to teach, share research, learn, make connections, and demonstrate new technologies. Please enjoy the meeting.

Sincerely,
Mary Patterson, MD, M. Ed
SSH President

The Society for Simulation in Healthcare (SSH) is a broad-based, multi-disciplinary, multi-specialty, international society with ties to all medical specialties, nursing, allied health paramedical personnel, and industry. It was established in January 2004 to represent the rapidly growing group of educators and researchers who utilize a variety of simulation techniques for education, assessment, and research in health care. The membership is united by its desire to improve performance and reduce errors in patient care using all types of simulation including task trainers, human patient simulators, virtual reality, and standardized patients. Recognizing that simulation represents a paradigm shift in health care education, SSH promotes improvements in simulation technology, educational methods, practitioner assessment, and patient safety that promote better patient care and can improve patient outcome.

A major venue for advancing simulation in healthcare is the annual International Meeting for Simulation in Healthcare that has been held successfully since 1995.

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Kathryn Adams, Director of Continuing Education
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Appendix 11: Leadership of the SSH

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Past President

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Secretary

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Treasurer

Kay MB Thiemann, MBA
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S. Barry Issenberg, MD

Univ of Miami Sch of Med
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Non Voting Director

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Healthcare**
Executive Director
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Doris Østergaard, MD, Ph.D

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Donna Towers

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Mary (Beth) Mancini RN, PhD, NE-BC, FAAN

The University of Texas Arlington, TX



Eric Brown, MD, FAAEM, FACEP

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William Riley, PhD

University of Minnesota
Minneapolis, MN



Appendix 12: IMSH 2010 Planning Committees

Program Chairs

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Katie Walker, R.N., R.M.

Administrative Planners

Robin Wootten, M.B.A., R.N.

Executive Director

Judy Larson

Director of Meetings & Events

Kathryn Adams

Manager of Continuing Education

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Educational Committee Chair

Viva Jo Siddall, M.S., R.R.T., R.C.P.,
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Plenary Session Chairs

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Katie Walker, R.N., R.M.

Immersive Track Chairs

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Yasuharu Okuda, M.D.

Steven A. Godwin, M.D.

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Pre-Conference Course Chairs

Paul E. Phrampus, M.D., FACEP

Bonnie Driggers, M.S., M.P.A., R.N.

Brian C. Brost, M.D.

Scientific Committee Chairs

Judith C. F. Hwang, M.D., M.B.A.

Peter Dieckmann, Ph.D.

Kianousch Kashani, M.D.

Workshop Committee Chairs

Mark Adler, M.D.

Carole Foote, MBBS (hons.) FACEM,
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Adam Cheng, M.D., F.R.C.P.C.,
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Expert Panel Chairs

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Tanja Manser, Ph.D.

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Roundtable Session Chairs

Frederick Korley, M.D.

Jean Ker, PhD

Bryn Baxendale, M.D.

Video Session Chairs

Thomas Belda, M.D.

Pamela Leonard, R.N.

Nursing Track Advisory Panel

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Pediatrics Track Advisory Panel

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Serious Games Advisory Group

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Education

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Finance & Audit

Kay Thiemann, MBA

IMSH Oversight

Lisa Sinz, MD

Mary Patterson, MD, M.Ed.

Membership & Bylaws

Christine Keenan, RN, MSN, CCRN

Nominations

Michael Seropian, MD, FRCPC

Public Affairs & Government Relations (PAGR)

Amanda Burden, MD

Chairs remain under consideration for the following committees:

Affiliations:

CATS - Technology Standards

Publications

Research

Appendix 13: Letter from Program Chairs (as printed in Syllabus)

Welcome to IMSH 2010

Dear Colleagues,

Welcome to the 10th Anniversary International Meeting on Simulation in Healthcare (IMSH), “**At the Threshold of a New Frontier**”. Delegate and exhibit numbers have exceeded those of previous years as this exciting innovation continues to permeate the healthcare infra-structure and training, as well as the design and development of future medical equipment. In a global sense we are at the threshold of many frontiers.

Some examples include:

- *A new era of climate change with recently the first global meeting of 117 world leaders in Copenhagen*
- *A global economy increasingly based on international collaboration*
- *An exponential pace of technological change and access to information that makes things possible that we never imagined. The interface between user and technology has become all-important, the leading example of which is the iPhone*
- *Parallels between evidence-based medicine and evidence-based educational practices, and how simulation can provide the link to improved patient safety and outcomes*

So, how do we as proponents of simulation take on the challenge before us and ride the wave, which will take healthcare simulation from niche to mainstream?

The guiding principle of the Conference Planning Committee was to provide delegates with a greater diversity of programmed events and to make simulation come alive at the meeting. To this end, we are introducing two brand new events: the “Immersive Courses” – live simulations taking place in a classroom environment; and “Simwars” – a simulation team challenge that is interactive for both participants and audience members.

To meet the growth of the field, we extended the conference themes to five categories. These are:

1. Education, Competency, and Assessment
2. Patient-related outcomes, Research in Simulation, including Patient Safety
3. Impact of Simulation Context and Physical Setting
4. Human Factors-Oriented, Simulation-Based Research
5. Emerging and Innovative Methods and Technology

The content and organization of the 2010 meeting addresses the spectrum of basic to advanced topics through a variety of engaging sessions that include pre-conference workshops, keynote presentations, expert panels, interactive workshops, roundtable discussions, immersive courses, Simwars challenge, an extensive video section, special interest and affinity group meetings and research abstract presentations. Multidisciplinary themes covering broad areas of research, education, simulation center operations, team training and assessment are embedded throughout the conference.

Session formats for the IMSH 2010 include:

- **“Expert Panels”** feature national and international experts who will discuss in-depth the “state of the art” of a specific topic that has been identified to be of significant importance to the simulation community.
- **“Workshops”** are interactive, “how to” sessions, intended to help you improve practice. In addition to those workshops selected through the highly selective peer-reviewed process, we have invited several broad-based workshops that span disciplines and professions.
- **“Abstracts”** are entirely your contribution and represent the most innovative, state-of-the art research in healthcare simulation. They are peer-reviewed and the authors of the most highly rated submissions will receive awards. For the first time, we will have five separate panels in which the awardees will be asked to give oral presentations describing their projects in-depth. All authors will present their work during the poster sessions and their abstracts have been published in the winter issue of the Society’s journal *Simulation in Healthcare* (SIH).
- **“Work-in-Progress”** are non-peer-reviewed abstracts that allow investigators to report their initial work, seek advice, or generate interest in a project that is ongoing. These abstracts are published in the IMSH 2010 Program Syllabus.
- **“Roundtables”** are moderated sessions during which attendees will discuss a very specific aspect of simulation. These topics are selected to give registrants an opportunity to give input on issues of importance to the simulation community and the strategic and program planning of the Society. The leaders of the Roundtables will develop a document summarizing the discussion to be submitted to the Board of Directors.
- **“Special Interest and Affinity Groups”**: Times are set aside for participants with similar interests to discuss common issues facing them, or even organize themselves into a collaborative group with an agenda that will contribute to the SSH and IMSH. Each session has a moderator, but the time is for you to use.

□ **“Exhibits”**: We invite and encourage you to visit the exhibitors to see a broad range simulation programs and products, including recent innovations that will be presented for the first time to our international audience.

□ **“Immersive”** Courses are for active participation in real time simulations.

□ **“Simwars”**: Healthcare team challenge whereby teams participate in a simulation and an audience response system allows delegates to rate the performance of the teams.

Other points of interest

□ **The Internetworking Café** is a place for our members and newly formed e-groups to meet, network, check email or just relax until your next session.

□ **Justine Cooper’s “Living in Sim™” Art collection**: We are privileged to have this exhibition at IMSH 2010. Justine’s beautiful images push the boundary of realism– check it out!

As you will see, the IMSH 2010 program has more offerings than ever before. We hope that there will be times when you will have to make a difficult choice between several interesting sessions occurring concurrently. The organizing committee tried to “keep our ears to the ground” to identify “hot topics” in the field of simulation. We followed threads on the SSH listserve, we listened to our colleagues at simulation conferences in Europe, Asia and Australia, as well as throughout the United States.

The newly formed international Nursing Advisory group was established to ensure that the needs of nurses were well addressed within the program. We are very thankful to that truly international and hardworking group who assisted with program development. As co-chairs of IMSH 2010, we wish to thank the program planning committee, invited faculty, SSH Board and committee members for their extraordinary dedication of time and effort to making this conference a success. In particular, we wish to thank the international group of Planning and Education Committee members who traveled to Chicago/USA for a face-to-face meeting in October 2009 to put together most of the conference program. Their wisdom and sage advice is reflected in the program you have in your hands. Special thanks to Judy Larson, Kathy Adams, Bonne Howard, Stas Jourin and Robin Wootten for their tireless efforts—they kept us moving forward amidst life events and demanding professional duties. The success and quality of IMSH relies on the generosity, contributions and insights of all these individuals. Thank you again for attending IMSH 2010 in Phoenix, Arizona. We hope you enjoy and are challenged by the meeting & break through your simulation threshold into your new frontier....

Katie Walker & Walter Eppich
Co-Chairs IMSH 2010

Appendix 14: Faculty List for IMSH 2010

A

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